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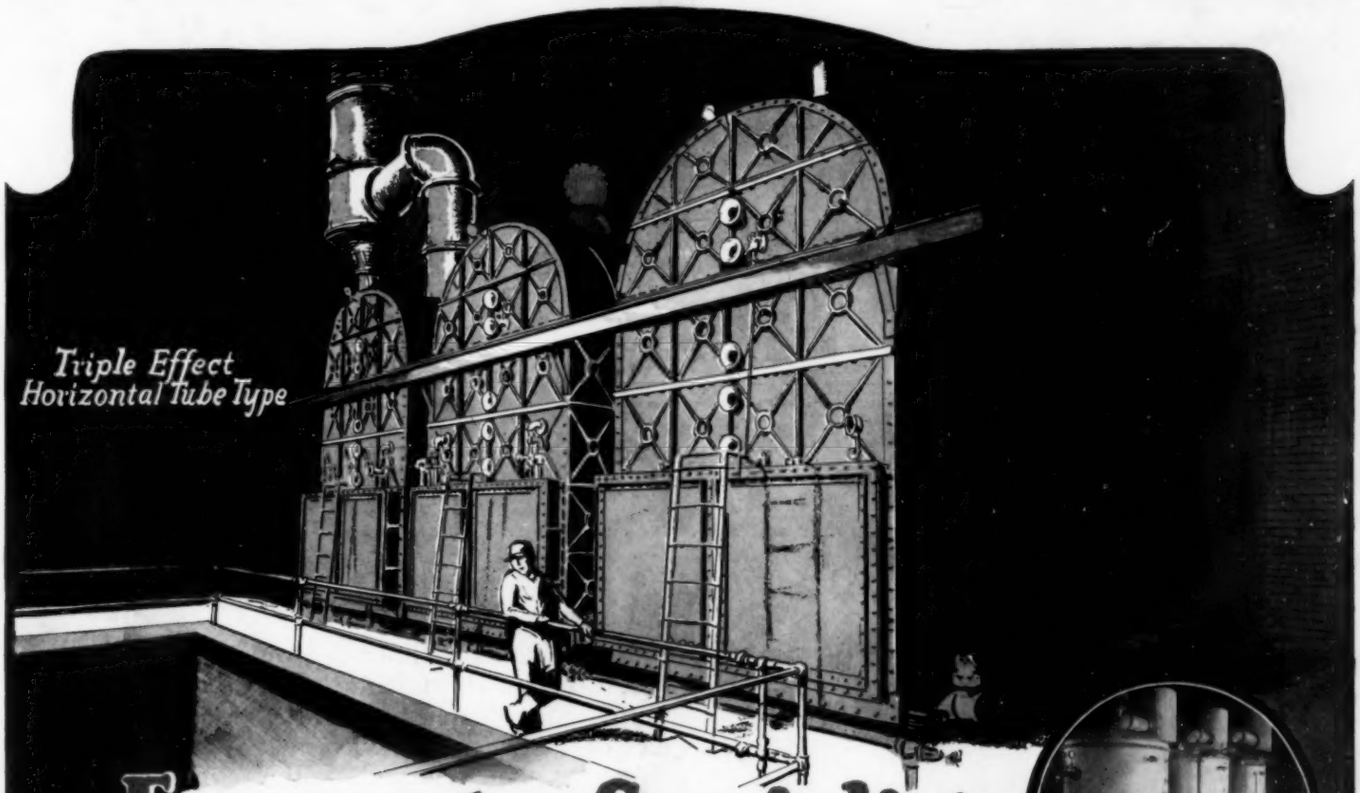

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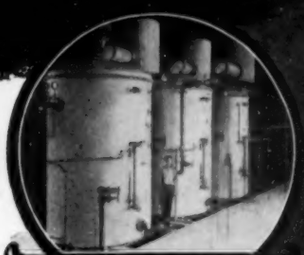

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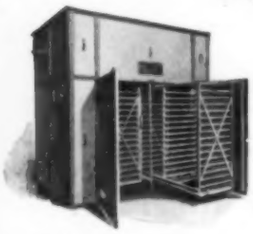

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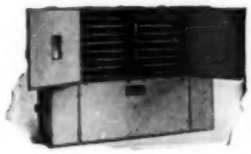

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CHEMICAL & METALLURGICAL ENGINEERING

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Editor

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College Professors And the Copyright

COLLEGE professors are occasionally taken to task for failure to recognize and observe some of the fundamental rules of business that in the commercial world are rigidly respected and enforced. Absorbed in their work of instruction and living in the academic atmosphere of the campus, they are prone to forget the practical considerations that govern business. The fact that their infringements are unintentional makes them no less real to those who are affected.

The latest voice to be raised against what is probably a thoughtless practice on the part of college professors is that of the National Association of Book Publishers, which observes an increasing disregard of the publisher's copyright. It appears that for one reason or another—the desire to reduce the student's expense or facilitate his collateral reading—the professor has adopted the practice of making mimeographed copies of portions of copyrighted books for distribution among his students. This, of course, is a violation of the copyright law unless permission is obtained from the publisher and author. Many books are written primarily for students, but if the author and publisher are deprived of a considerable part of this market the authors lose their royalties and publishers their profits on books that might have been sold but for the distribution of mimeographed copies of an important chapter or an extended excerpt.

The practice complained of has grown to such proportions that the members of the National Association of Book Publishers have decided to refuse future requests for permission to mimeograph and distribute parts of copyrighted books. *Chem. & Met.* believes, however, that the consequences of the practice have only to be called to the attention of the teaching profession to insure its discontinuance.

Another Victim of The Daugherty Régime

IN THE issue of May 26, *Chem. & Met.* published an editorial correcting some misleading publicity that emanated from the Daugherty régime in the Department of Justice. The items in question reflected upon the integrity of men prominent in the Nashville Industrial Corporation and were designed as bouquets for Mr. Daugherty's post-war achievements in the Department of Justice. These points were discussed in our editorial and it was further mentioned that the Mr. Morse of the Nashville Industrial Corporation was not connected with E. C. Morse, who was then under federal indictment for criminal conspiracy.

Since then an indictment against E. C. Morse has been dismissed in a federal court. This is the second time it has happened within 6 months and it looks as though the Morse indictments were just another of the products of political propaganda that flourished under Mr. Daugherty.

Ernest C. Morse was director of sales in the War Department under Secretary of War Baker and was responsible for the sale of $1,600,000,000 of war supplies. As a result of his efforts the government netted $1,250,000,000, which must be regarded as a highly creditable performance. Of the thousands of contracts that were effected only three were called to account after a searching investigation. It was pointed out that the government not only did not show but did not even claim that Morse had profited by these transactions. Such outrages as the indictment of men like Morse are undertaken to simulate the honorable activity of a faithful public servant. Certainly the prosecution of such men does no good to the government nor yet to the people. Is it too much to hope that the time will come when honest public servants will not be persecuted to fatten the political capital of self-seeking politicians?

World Markets For Phosphates

BEFORE the World War the American fertilizer industry was financially successful largely because as a whole it found great unsatisfied foreign markets for phosphate. This permitted more economical operation of domestic phosphate mines than would have been possible in caring for domestic markets alone. Thus acid phosphate, the backbone of the domestic fertilizer business, became plentiful and cheap.

Just now the phosphate exporters are confronted with a new cause for concern in the development of North African phosphate deposits. Morocco, Tunis, Algeria and Egypt all are actively entering world markets to an extent not thought of 10 years ago. The consequence undoubtedly will be a reduced opportunity for export of phosphate rock from the United States. Whether it will be possible to retain the foreign markets by conversion of the rock to high-quality phosphate products before shipment is a serious question. But it is a problem that undoubtedly will receive early consideration in the industry.

The exporter of phosphate is not alone concerned in this matter; the domestic user also may become acutely interested. The United States production of about two and a half million tons of rock per year has been divided recently one-third for shipment abroad and two-thirds for domestic use. Let us suppose that the one-third that has gone abroad no longer finds a market there. Then obviously the domestic user will have to pay overhead expense and capital charges on the whole business.

This means a 50 per cent increase in such items, not an inconsequential amount per ton of acid phosphate.

There is no obvious remedy to suggest for these changed world conditions. It is worth while, however, squarely to face the facts and begin to figure just what the consequences are going to be if some way around the difficulty is not discovered.

Progress in the Art Of Hardness Testing

AT THE International Steel Exposition to be held in Boston this month a committee of the National Research Council will conduct a symposium on hardness testing. One of the topics of discussion will be the old question as to the meaning of any given hardness number and the problem of ascertaining the fundamental properties of a metal that determine such "practical properties" as, for instance, machinability under given conditions or resistance to a given type of abrasion. The problem of testing hardness scientifically is still far from complete solution, but real progress is being made; it is now recognized almost generally that any hardness test measures a property that is the resultant of several more fundamental properties, and that any "practical property" which we wish to determine is also the resultant of several fundamental properties.

A test that is proving to be of assistance is one that is not ordinarily considered a hardness test, but one that helps us to interpret the results obtained from the usual hardness tests. It is the notched bar impact test, in which a bar of metal is broken and the energy consumed measured. With proper procedure, figures can be obtained that show promise of being truly indicative of important fundamental qualities of the metal.

There begins to appear a dim picture of the probable eventual solution of the hardness testing problem: a group of hardness tests of different kinds giving us a set of simultaneous equations, the solution of which will produce the fundamental figures to be fitted together to provide an accurate indication of the "practical property" in which we are interested.

Paints as Fire Retardants

IT HAS long been known that a painted wood surface is not as readily ignited by a small fire as bare wood, especially if the wood has been weathered. But lately some paint manufacturers have been undertaking to stretch this conclusion beyond the tensile strength of the facts. Claims are made for some of the so-called fire-retardant paints that they are fireproofing materials with marvelous properties, that they will prevent wood ignition from all sources and thereby prevent the starting of all accidental fires that originate with wood as their fuel.

Prominent mention is made of the fact that tests are being made by certain institutions, cities or corporations without reference to what the results of the tests may be. This is unfair to those that have consented to make the tests and unethical in that the public often does not distinguish between the fact of making the test and the results, which may be anything but favorable for the promoted article. While there is a natural reluctance to judge new products or old products under new names until the results of adequate tests are known, investigations that have been made on the general subject indicate fairly conclusively that the protection that can be afforded by paint coatings is of a very temporary character. This might be expected considering the thickness of the paint film, which is only a few thousandths of an inch as compared with ½ to 1 in. of plaster generally considered only as temporary protection and the 2 in. or more of solid materials required for full protection of structural members under the various fire conditions that occur.

The paint industry is entitled to the advantage that accrues from the rather minor retarding effect on the kindling of wood resulting from proper painting. But in the long run the industry will be damaged rather than helped if the idea gets abroad that unreasonable fireproofing is claimed. It is to be hoped that the legitimate advertising and propaganda prepared by the paint industry will not be lessened in value because a few unreasonable manufacturers claim too much for their product. Wherever the industry itself can stop the tendency to exaggerate, it will do well to insist vigorously upon only conservative and fair statements in the trade literature.

Wanted: A Modified Wood-Pulping Process

NO EFFORT can well be spared by the pulp-producing industries to conserve their rapidly dwindling supplies of raw material, especially the highly valued spruce. To this end the imminent need of reforestation to meet future requirements has already been stressed. As a corollary there is need, hardly less acute, of utilizing remaining forest resources in such a manner that the gap may be bridged between present stands of suitable pulpwood and the certain inroads that are to be made on these until the time when reforested lands begin to bear timber. No more logical means of attaining this end is immediately apparent than developing a method for substantially increasing the percentage of the log that is converted to pulp.

At present the chemical processes, soda, sulphate and sulphite, yield an average of 45 per cent of the weight of the wood chipped. The remaining 55 per cent is irreparably lost in the cooking liquors. The groundwood process yields nearly 100 per cent, but has limitations in the varieties of wood that can be used profitably, being confined in large measure to spruce and fir. With these latter woods fast disappearing in regions where the industry has been established longest, notably in northern New England and New York State, it is apparent that a process that would enable these mills to continue production of their ultimate product, newsprint, would prove a welcome solution of an increasingly difficult problem. Likewise in the chemical processes, if instead of 40 to 45 per cent a yield of 70 to 90 per cent could be attained, a very great saving in raw material would be effected.

The magnitude of this saving cannot be closely estimated, because it is impossible to predict the applications of new varieties of pulp. In 1922, however, 4,577,000 cords of wood was used for sulphite production, 759,000 cords for soda, 1,220,000 cords for sulphate and 2,592,000 cords for groundwood. Assuming that

one-third of all the wood now going into the chemical processes could be pulped in a manner yielding 75 per cent, a net saving of 660,000 cords could be effected on the basis of 1922 production. As our total output increased, the net amount conserved would undoubtedly grow correspondingly.

Many attempts have been made and tests are now being conducted to develop a method that would make these savings possible. The details of Dr. Tingle's process were outlined in *Chem. & Met.* on Aug. 11. By using lime and sulphur in a low-pressure cook of 10 to 12 hours, followed by beating with sulphite acid, he obtained a 70 per cent yield of a strong dark pulp entirely suitable for such paper as wrapping and bag. For many years the Forest Service of the United States has been working on the problem, and while nothing startling has so far resulted, recent efforts have been attended by more than usual success. It has been found that by combining a modified, short-time digestion with vigorous mechanical disintegration 75 to 80 per cent of the weight of the wood might be obtained in a strong, light-colored pulp. Low chemical cost combined with low power requirements, with the added promising possibility that hardwoods and pines may be used satisfactorily, serves to justify a reasonable degree of optimism as to the practicability of the process. So far experiments have not been carried to completion and it is too soon to predict that either Dr. Tingle's process or that of the Forest Service provides a logical means for combating an increasingly desperate situation. It is opportune at this time, however, to emphasize the possible significance of this sort of research to the industry, because of the extreme need for some modified process. With a possible saving of from 20 to 30 per cent of much of the wood being chemically disintegrated, providing a probable stronghold for the groundwood industry in many sections of the country where it is now threatened with extinction, there can be no doubt as to the wisdom of making a serious and if possible a concerted effort to develop a new method of pulping wood.

Chemical Progress and The Theft of Ideas

A PERVERTED sense of right and wrong is the only interpretation we can make of the action of an executive who deputes a dishonorable task to a subordinate, or who employs a sleuth to obtain information and data to which he has no moral right. However, if the theft of ideas were as punishable as the theft of tangible property, the jails would be filled to overflowing.

The inventor has a hard task to obtain credit for his initiative, without considering financial return. He deserves freedom to develop his ideas without fear that they are being purloined by others. He should, therefore, be safe from the unwelcome attentions of pirates and sneak thieves. Not so, however, with one of our subscribers, who has developed a novel and worth-while chemical process and carried it to commercial success on an operating scale. The time is not quite ripe for the publication of details, although these doubtless could be obtained by a close examination of the apparatus used and its contents. Pending the granting of patents and the publication of data, the plant has been the scene of stealthy visits by spies, evidently employed by rival firms that hope for commercial success by theft rather than by personal initiative. Not only is it necessary to take special precautions to guard the works, but insidious overtures are being made to workmen, when the superintendent is absent, that they divulge details in return for a money consideration. Such tactics indicate no respect for technical or business morale, and no consideration for personal rights and property. They tend to undermine personal and company loyalty among subordinates, and eventually to hurt the industry, which the inventor is elevating to a higher plane by his initiative.

We have before us affidavits referring to recent happenings of this character in southern California; and it is to be hoped that this intimation will act as a warning to chemists and chemical engineers in that locality to be on the alert and will lead to a cessation of such despicable tactics before a complete exposure is made that would deflect unfavorable attention on those primarily responsible.

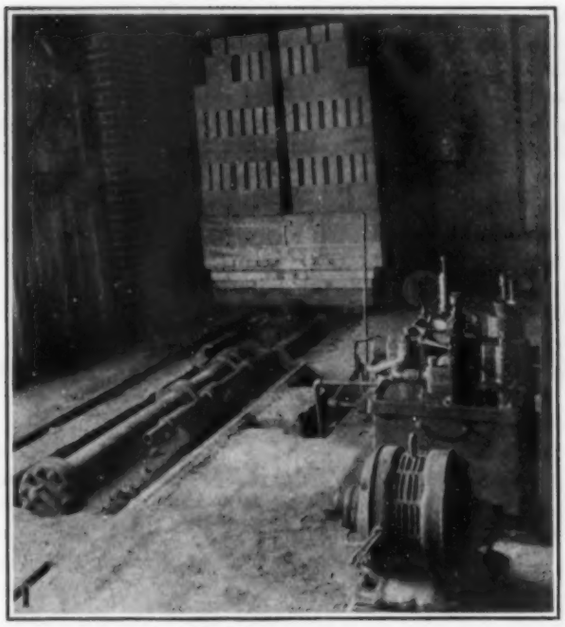
An Invention Of Great Promise

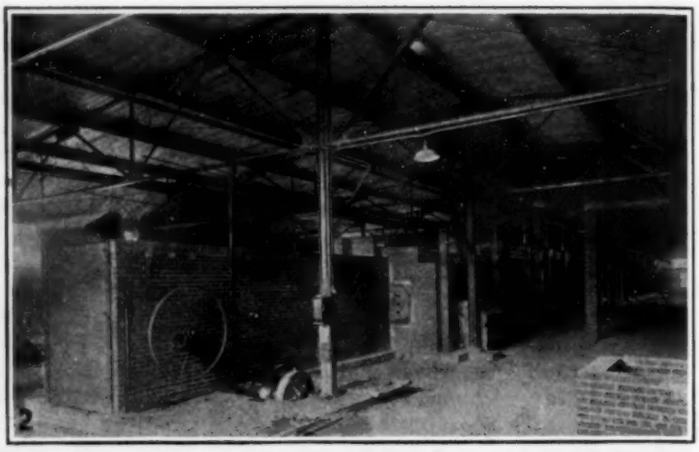
ELSEWHERE in this issue is an item that should be scrutinized with great care, for the possible changes in industry that hinge on the further development of the new machine there described are enormous. The item referred to is that recounting the successful development of a two-cycle, double-acting oil engine.

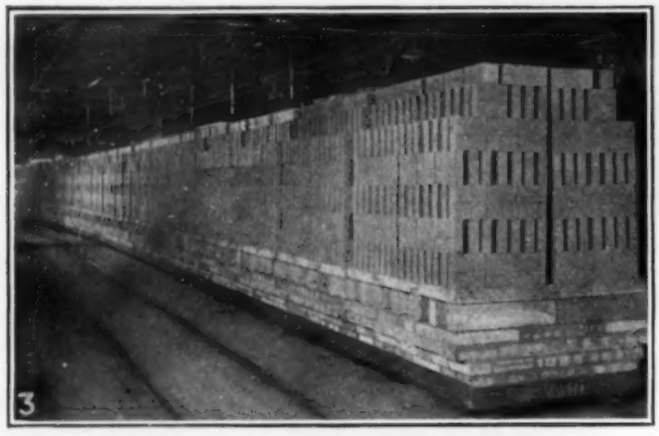
In all the plans that have so far been laid to meet the ever-growing power requirements of the country, no consideration has been given to the oil engine. It has been thought that the best of oil engines—the Diesel type—could not be built in large enough units to enable it to compete with steam machinery in the generation of central station electric current. Hydroelectric power, it is contemplated by these plans, will be developed to the greatest possible extent and will then supply a part of the future power demand. But most dependence is being placed on great steam-electric central stations—stations burning raw coal in enormous quantities under their boilers and thus destroying forever the great storehouses of the raw materials of chemical industry—stations whose ideal use of the heat units they consume is much less than the thermal efficiency of even a fairly crude internal combustion engine.

But here is this new development, one that already permits the building of an engine with twice the horsepower per cylinder that is possible with the four-cycle Diesel type heretofore used. As the makers of this new engine state, it becomes a direct competitor of steam machinery. And the development is still at its beginning. It is no fanciful dream to look forward to the day when even larger oil-engine units will be successfully built and operated.

And when this comes to pass, it will mean a great change for American industry. For these new engines will operate as well when fueled with the oils distilled from coal as with petroleum. A new era should break, an era in which the byproduct values of coal are no longer largely wasted up the stacks of steam-electric generating stations, an era in which these latter stations burn the residue fuel, while the oils are used in oil engines and the practices of transporting and burning raw coal are things of the past.







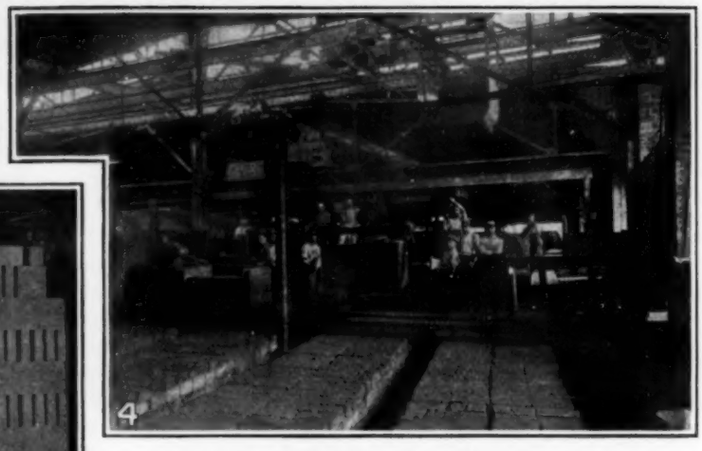


Fig. 1—Car of Green Brick Entering Drier

Note: The hydraulic pusher shown here has been replaced by the conveyor described in the article.

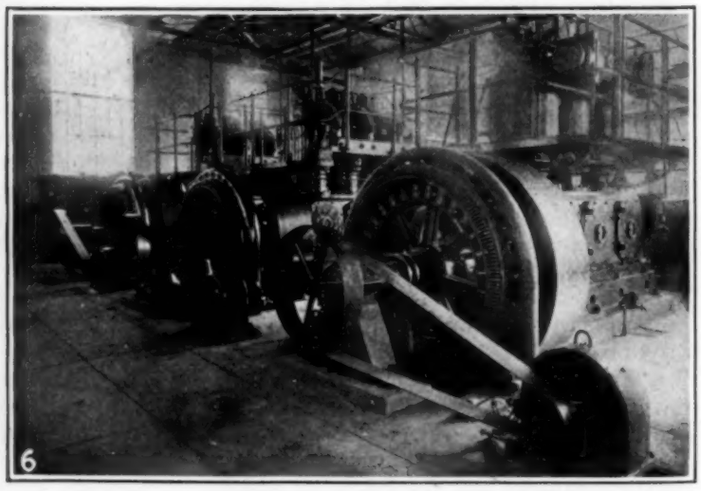
Fig. 2—American Dressler Tunnel Kiln Looking From Entrance End

Fig. 3—Cars of Burned Brick Awaiting Sorting After Having Passed Through the Tunnel Kiln

Fig. 4—Sorting Brick and Loading on Carriers at the Unloading Station

Fig. 5—Method of Using "Jack Lift" Trucks for Piling Brick Into Storeroom or Loading Into Freight Cars

Fig. 6—View of Power House With Rathbun-Jones Gas Engines and Direct-Connected Burke Generators



Up-to-Date Equipment in the Brick Plant

Mechanical Handling Equipment in Face Brick Manufacture

An Example of the Fullest Application of Mechanical Handling Equipment in an Industry Where Low-Priced Product Has Made Such Development Difficult

By Graham L. Montgomery
Assistant Editor, *Chem. & Met.*

The most casual observer of the trend of industry in substituting mechanical handling devices for hand labor will notice one rule of almost universal application. That is, when the value of the finished goods is high and the margin of profit great, the resistance to such a course is not strong; but when the sale price of the finished product is low and the net return is small, it is almost impossible to convince the manufacturer that he should adopt some substitute for the unskilled laborer.

Reasons for this attitude are easy to find. The first cost of material handling equipment is comparatively high. The industry where the margin of profit is small is loath to tie up large amounts of capital in expensive equipment, preferring to pay out, bit by bit, a larger total for unskilled labor than would be necessary to meet the capital charges and operating cost of the mechanical equipment to supplant it. This is because the labor cost is paid out from current gross income and does not involve any increase in capital expenditure.

Reasonable as this attitude may seem at first glance, it is the banker's attitude and not really the best policy from an engineering standpoint. Ability to meet the market in its various fluctuations is dependent much more on manufacturing costs than it is on capital charges. It needs no demonstration that the manufacturer of a necessity whose production costs are lowest is in the best position to weather a slump in business and it is worth while to incur higher capital charges if this end of low production costs can be thus attained. The example of what can be done in an industry with a low price for finished goods that is given herewith is suggestive of how other plants can improve their position.

THE manufacture of brick is usually considered a rather crude process and one not adapted for the application of much expert engineering or for the use of much expensive equipment. Of course, the kilns have always been a rather expensive item; but the remainder of the equipment has pretty generally been confined to the simplest that was obtainable. In line with this policy the handling equipment has been almost primitive, running the gamut of the various types of wheelbarrows and including many forms of two- and four-wheel trucks. Larger plants and those making a slightly more valuable product such as face brick have in the past adopted many systems of industrial railways and these have in the main been successful. But these successes have not until lately caused any interest throughout the brick industry in the economic advantages of modern mechanical handling devices and the consequent lessening of unskilled labor for plant transportation purposes.

Of late, however, the achievements of handling systems in other branches of industry have aroused much interest among brick manufacturers. In addition, the shortage of unskilled labor that has grown out of the recent restrictions on immigration has made it almost a necessity for manufacturers in all lines to employ every possible means that promises the elimination of this class of worker from the plant. In the light of these facts, the plant here described, in which the most modern mechanical handling devices have been adopted throughout, is of particular interest.

The Bradford Brick & Tile Co. has its headquarters in Bradford, Pa. It operates three plants, one in Bradford and two at Lewis Run, 6 miles to the south, where the shale bank is located. It is with one of the plants at Lewis Run, the newest of this company's properties, that this article deals.

The shale is mined at a level about 60 ft. higher than the plant. It is shot down from the face of a cliff with dynamite. Two Erie shovels are used at this point for loading the shale into industrial cars, which are side dump cars of 5-yd. capacity made by the Western Wheeled Scraper Co. Two shovels of moderate capacity are used rather than one large one, as there is thus a spare in case one breaks down; and when the two are both operating a better mixture of material is obtained.

After the cars are loaded, they are hauled by either a Plymouth gasoline or a Goodman electric industrial locomotive (there being one of each in use) to the hopper above the crusher. This dumping point is located in the top story of the crusher house, which is at the top of the slope just above the brick plant. The cars empty into a large steel hopper, dumping being accomplished by means of a fixed tripping device on the opposite side of the track from the hopper opening. Thus the cars are always dumped at the same point. This dumper is made of a steel rail so bent that the off side of the cars rides up on it and is tipped sufficiently to let its load slide out into the hopper.

At the bottom of this hopper is a Stephens-Adamson

apron feeder operated by a gear and dog ratchet feeding device that insures the steady feeding of the crusher in the proper amount, which is fixed at 500 tons per day. The crusher is a McLanahan-Stone single roll crusher. In it the larger lumps of the shale are broken up and the whole mass is reduced to a fairly uniform fineness. Immediately below this is situated another crusher, which completes the work of crushing necessary as a preliminary to the grinding.

Grinding the Shale

The material passing out of this second crusher feeds direct onto a troughed belt conveyor 20 in. wide, of General Rubber Supply Co. manufacture with Main Belting Co. idlers. This carries the crushed shale about 400 ft., over the tracks of the B. R. & P. Ry. and across a little gully to the top of the grinder house. The material is here fed into large bins, which feed the grinding pans and serve to give a reasonable amount of storage against emergency at this point. From the bins three outlets lead to three small Jeffrey apron feeders. Each of these feeders feeds one of the three specially designed grinders. These grinders, of the dry pan type, are of great capacity, three having replaced the eleven dry pans formerly required to do the work. Each of the rolls of these machines weighs 7½ tons. They are driven from electric motors, direct-connected through flexible couplings and driving through a bevel pinion and gear.

After being ground, the material from the pans drops into the boot of a Jeffrey bucket elevator, there being one of these elevators to serve each grinder. The elevators raise the dust to the screening room, which is located over a large storage bin of 500 tons capacity. The screens are six in number, of the Tyler "Hummer" type. The elevator from each grinding pan feeds two of these screens. As the dust passes down over the electrically vibrated screening surfaces the fines pass through and the coarser matter, which has not yet reached the desired degree of fineness, is returned directly to the grinders.

So far in the description of the plant the system outlined has been common to all three of the plants of the Bradford company, for the 500 tons of shale handled daily by the equipment described above is the amount needed for the operation of the whole outfit. The separation of the product occurs at the bottom of the storage bin described last. At this point several gates are located. Under each of these gates is a rotary disk loader, which distributes the fine dust evenly on one of three belt conveyors. One of these belts feeds the dust into box cars that are used to transport it to the plant in Bradford. The second feeds the older of the two plants at Lewis Run. And the third, which is followed out in the remainder of this article, feeds the new and modern plant. This latter belt is 16 in. wide, troughed and runs like the other belts in the plant on Main Belting Co. and Stephens-Adamson idlers. It has a capacity of 50 tons of dust per hour. It is about 600 ft. long and at its discharge end dumps into a storage bin of 300 tons capacity. In its course this conveyor passes out of the building in which the large storage bin is located, over the entire old-style plant and into the top of the new plant, where it discharges into the smaller storage bin. In this long passage out of doors a novel means has been taken for protecting it from the weather. A galvanized iron duct, shaped like a three-quarter segment of a circle, has been set over the belt. This has the advantage of being so light that no supports other than those necessary to hold up the conveyor and its load are necessary. A further advantage is that this type of housing is much less costly than the usual shed type.

Fig. 7—Steam Shovels Loading Shale Into Dump Cars at Shale Bank

Handling in the Brick Plant

Three products are produced in this latest of the plants at Lewis Run. These are face brick of two kinds —dry-press and stiff mud—and small flat tile such as are used for flooring work. The manufacturing plant for these products is located directly beside the 300-ton storage bin, so that the dust is conveyed to the machines by separate sets of disk feeders and belt conveyors. These machines consist of a dry-press for dry-pressed brick, a pug mill, auger machine and cutter for stiff mud brick, and a similar equipment for flat tile. The dust is fed directly into the dry-press. For the stiff mud brick and tile it is fed into the pug mills.

The brick from the dry-press are loaded by two workers onto a tunnel kiln car, which travels on a track directly in front of the press. The loaded cars are moved by a small electric locomotive, which runs on an adjacent narrow-gage track, up to the point where the pusher for the drier takes them. This pusher is a double chain with dogs that is set flush with the floor between the rails. As the car comes even with it on the track, one of the dogs engages a lug on the bottom of the car and it is conveyed into the drier at the appropriate speed.

The stiff mud is extruded from the augur machine onto a belt, which carries it into the cutter, where it is cut into the proper size to give a brick of the desired dimensions after burning. The cutter delivers the cut brick to a continuation of the first belt. This carries them along over the narrow-gage tunnel-kiln car tracks at a height just above the top of the kiln cars. A kiln car is placed under the belt on each of these tracks and four men, working between the cars, load them with the proper amount of "green" brick. The imperfect brick are allowed to continue on the belt to the end, where they spill off into an inclined belt elevator that elevates them and delivers them to a return belt conveyor at an elevation sufficient to clear the top of the pug mill. This return conveyor dumps the rejects back into the pug mill, where they are reworked into good brick.

The tile from the tile machine are piled by the operator of this machine on carriers of a Louden over-

head carrier system. The tile are allowed to dry in the air for 24 hours, when the loaded carriers are moved to a position over the cars of unburned stiff mud brick at a point just before these enter the drier. At this point there is a raised working platform between the two drier tracks that carry the stiff mud brick cars. Here a small quantity of the tile is loaded onto the top of each load of stiff mud brick. This serves two purposes. It gets the tile burned to an even shade and eliminates the use of expensive multi-deck cars that would be necessary if complete cars of tile were run through the kilns.

As is evident from the foregoing, there are four tracks for narrow-gage, tunnel-kiln cars leading through the drier. These tracks are spaced so that between each pair there is room for the extremely narrow-gage track that carries the small electric pusher locomotive. This locomotive serves to handle all the cars to the point where they are taken by the drier pusher-conveyors, one of which is located in the center of each of the four tracks through the drier. These conveyors extend about two car lengths outside the drier on the entrance side and about an equal distance into the drier. The cars in the drier beyond the reac of the pusher conveyor are pushed by the cars behind.

The pusher is so regulated that it pushes the cars o brick very slowly through the drier and delivers them at the other end in a number just sufficient to satisfy the capacity of the two tunnel kilns. As the cars are pushed out of the drier they are taken into a transfer car that runs on a transfer track extending across the delivery end of the drier and the entrance end of the

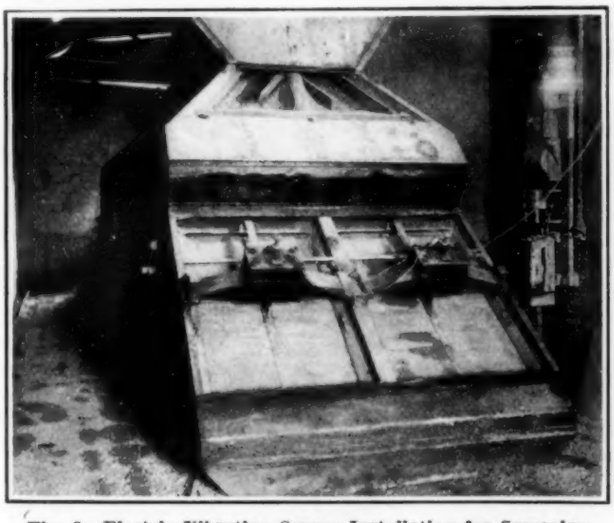


Fig. 8—Electric Vibrating Screen Installation for Screening Crushed Shale

kilns. This car then conveys the car of dried but unburned brick to the proper kiln—one of these kilns being used for burning the dry-press brick and the other being used for burning the stiff mud brick and tile. A pusher conveyor similar to those used on the drier is located at and extends for a short distance into each of the kilns. These conveyors take the kiln cars and move them slowly into and through the kilns, one car pushing the next beyond the reach of the conveyor, as was noticed in the operation of the drier.

At the delivery end of the kilns, 337 ft. away, the cars of burned and cooled brick as they are pushed out of the kiln are taken onto another transfer car. By this they are delivered to the other end of one of the four tracks previously described as serving the drier. Because the travel in the kiln is so slow—being only about 60 in. per hour—there is a traveling-arm device on the electric transfer car at the delivery end to enable the cars to be drawn out quickly.

When the car of burned brick has been placed on the far end of the drier track it is moved along this by means of the electric pusher locomotive described above and a cable car puller to a position alongside a platform that extends over the four tracks some distance before coming to the place where the stiff mud bricks are loaded on the cars. This platform is of just sufficient height for the empty car to pass under it. Across it

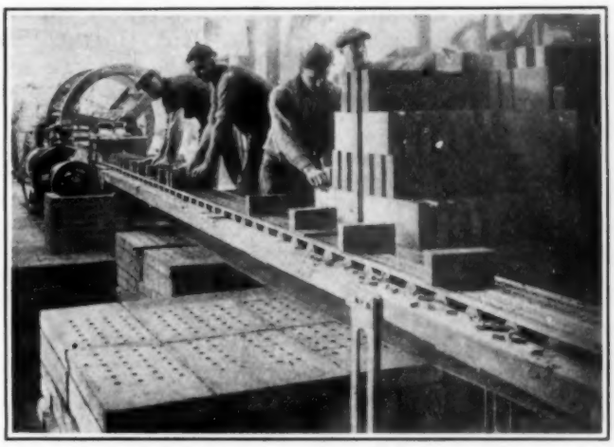


Fig. 9—Setting Green Brick on Tunnel Kiln Car, With Cutter and Augur-Machine in Rear

extend two lines of gravity roller conveyor—set level. Eight workers and sorters located on the platform unload the cars. The good face brick, which constitute more than 90 per cent of the load of each car, are sorted to shade and placed on a carrier that rests on the roller line nearest to the car. The seconds, which are sold for common brick, are placed on a carrier that is on the other line. When the car is empty, the locomotive pushes it onto the place where it is again loaded with either of the two forms of brick made. The tile from the tops of the cars is also sorted in the same way, placed on carriers and handled into and out of storage in the manner that will be described below for the brick.

Above the two lines of roller conveyor is a monorail hoist line carrying a monorail electric traveling hoist made by the Sprague Works of the General Electric Co. By means of this machine the filled carriers of sorted brick are lifted and carried to the appropriate position in the storehouse, which is the immediately adjacent parallel building. The bricks are stored in great piles in this building, which has a storage capacity of 6,000,000 brick. The commons are carried straight through this building and are stored on the other side of the adjacent railroad siding in the open. In the storehouse the carriers are left for the storeroom gang to unload, while the carriers for common brick are dumped and immediately returned to the point of loading.

Since the brick are brought in overhead, it is easy to stack them to a ceiling height of 25 ft. in the storeroom. The operators place a wooden platform across the aisle that runs around the storehouse next to the wall, one side resting on any one of a series of cleats that are fastened to the wall and the other side being on the brick pile. The loaded carrier of brick is placed on this

platform and can thus be spotted easily in any quarter of the warehouse in which it may be desired to stack the brick. The platforms mentioned above are light and are readily moved from one place to another.

Face brick are shipped in box cars. The method of loading these is to take the brick into the cars on an Elwell-Parker electric lift truck or on hand-operated "Jack-lift" trucks. These trucks are arranged to handle the same carriers used on the monorail hoists, so that the brick can be loaded into box cars directly from the kiln cars or from the piles in the storage shed. When a car is placed ready for loading, it is a matter of but a short time to transport sufficient of these loaded skids into the car to make up a carload. While the men in the car are unloading the first skid brought in, the truck goes back for another loaded skid. In this way both the truck and the men in the car do not have any waiting to do, but can keep steadily at work until the car is loaded.

The culls and bats are carried over the common brick pile by the hoist, and are dumped on a pile that is maintained there for that purpose. Eventually this pile will serve to form the foundation for a new brick storehouse when additional space is needed.

Ten years ago about 150 men were employed, producing an average of 65,000 brick a day. Today 110 men average a daily output of 125,000 brick. The first appreciable saving of labor was effected by the introduction of steam shovels. The mechanical handling and conveying of raw materials made a second reduction; the tunnel kiln brought a saving of 50 per cent of the hand labor necessary for manufacturing, drying and burning the brick; and the new methods of sorting, storing and loading the finished brick saved one-third more. These figures, moreover, represent less than one-half the total savings, for the tunnel kiln requires only 40 per cent as much fuel as the old down-draft kilns, and the quality of the product is so improved that there is an appreciable decrease of common brick. The erection of a power house and the use of individual electric motor drives not only made a reduction in power costs but also increased the reliability of the plant machinery.

If we charge the carrying expense of the investment, the operating charges and a fair depreciation against the savings effected by the system, and then figure the balance as the yearly profit realized from the handling system, it can be safely stated that such an equipment pays for itself within 3 years after its installation.

The German Viewpoint on the Dawes Plan

Chemical Industry Regards It as a Temporary Stimulus That Will Pave the Way for Voluntary International Agreements

From Our Berlin Correspondent

NEEDLESS to say, the whole outlook at the moment in the chemical as indeed in every other industry in Germany is profoundly affected by the Dawes reparations scheme. Under any reparations solution, the chemical industry holds a unique position. German reparations payments can, in the last resort, be made only through the medium of export of manufactured goods, and necessarily those things in which Germany has always specialized will find the readiest use for this purpose.

Under the Dawes plan, Germany pays reparations, in the first instance in marks, into a Berlin bank founded for this purpose. It then remains for the Reparations Commissioners to decide what will be done with these marks. Doubtless a great deal of the deposit will be expended in buying dyestuffs, nitrates, pharmaceutical specialties, potash and coal-tar chemical derivatives. This will certainly have a very reviving effect on the whole German chemical trade. A very prominent manufacturer, approached for his opinion on this point, said that Germany has suffered very severely through the competition that has arisen from new industries created since the war broke out, in countries where it was impossible owing to the blockade to obtain German chemicals. The dyestuff industry is a case in point.

Whether or not this new competition has been a good thing for the world in general is an open question. It has cheapened some chemicals, others it has made dearer. If we assume a permanent possibility of new wars, then it has its useful aspects. But judged from the economic point of view it must seriously hamper industrial development. When several nations are all trying to establish an industry producing identical products, no one of them will risk vast sums on research. The infinite range of colors produced by the German dye manufacturers before the war was due to the fact that, having a virtual monopoly, they did not need to fear the cost of research. And as regards prices, while it pays to produce, say, 10,000 tons of a given dye per year when one holds the natural monopoly, it is unprofitable to make 2,000 or 3,000 tons when competition is cutting prices.

Stimulus to German Chemical Industry

The effect of the reparations payments under the Dawes plan will be to favor the German chemical industry. Wherever competition in other countries has not caught up, large orders will be passed to the German industry from the official bodies of other countries, even where this may not be strictly in the interests of the home chemical industry of the country in question. The imperative need for using the money that accumulates in the Berlin Reparations Bank will stimulate the export of German chemicals. The governments of the countries in question will also have an interest in seeing that the German chemicals they buy are not too high in price when they reach their intended markets.

It is believed, therefore, that prohibitive customs duties and other restrictions are likely to be lowered or removed. It is also not without importance that the governments of countries to whom reparations are due will have an interest in sending German chemicals to other markets than their own, because in that way they get indirect reparations payments. We therefore are faced with the prospect of commercial competition carried on by government bodies on a large scale.

The leading men in the German chemical industry are, however, far too sane to think that this will, in the long run, save the German industry. It will merely give it a temporary stimulus. The industry itself now believes that its real salvation will be found in voluntary international agreements between the industries of different countries, so that the field of competition shall be divided. "Unite and Rule" is the present motto. But the execution of the Dawes plan will be the means of bringing these other countries to an acceptance of the same principle.

When Can Industry Afford to Use Gas as a Fuel?

A Consideration of the Cost of Raw Coal and of Manufactured Gas With Relation to Their Use in Industry

FOR MANY YEARS the low cost of labor and the apparently high cost of gas prevented manufacturers from considering its use. Gradually, however, it has been realized that the actual cost of the fuel was not the prime consideration. Gas is easily transported and no storage is required. Labor costs are reduced to an absolute minimum. Any temperatures can be readily obtained and maintained. Heat can be applied just as required to any definite part of a process, with definite intensity varying from the softest to the most intense flame. Combustion can be localized or spread over large surfaces. Oxidizing or reducing conditions can be brought into play at will. As soon as the demand for heat ceases, the fuel supply is shut off; there is no waste.

Where Gas Is Ideal Fuel

There are many processes in industry in which gas immediately commends itself as an ideal fuel. In the textile trades, hat making, boot making, the motor car industry, etc., the cost of fuel is a minor consideration, while convenience, cleanliness, labor saving, evenness and exactitude of temperature are the factors that count. In such industries the use of gas will rapidly increase and only publicity is required to convince the potential user.

Take next those industries in which the cost of fuel is a more important item, but on which the exactness of application of the heat is of paramount importance. Progressive managers are finding that the use of clean regulatable heat not only possesses the general advantages indicated but reduces the amount of wastage. Such processes as melting metals, billet heating, core drying, brazing and welding, baking foodstuffs, etc., all come within this category and headway is being made.

A third class of industries is that in which the cost of fuel is a major item and the savings effected by the use of gas are limited to labor and transport, saving of space for plant and storage, the non-production of smoke and the recovery of byproducts. To meet the needs of these industries gas must be low in price. In large works individual gas-making plants have been installed, but gas making is a technical business and it has often been found that the gas-making plants give such extra work and responsibility to the management that the benefits arising out of the use of gas are nullified.

What Can Industry Afford to Pay?

We should try to form some idea as to what industry can afford to pay for gas as compared with solid fuel. In the computations I will take the therm—that is, 100,000 B.t.u.—as the basis. A ton of ordinary coal has a calorific value equal to 290 therms. Taking the value of coal delivered to a works at 35s. per ton, the cost per therm will be 1.45d. Gas is being sold today in large quantities for 4.4d. per therm, or at about three times the price of raw coal. The heating efficiency of the raw coal fire or furnace is not, on the average of cases, greater than 25 per cent, whereas the heating efficiency of a gas furnace can be taken as 70 per cent. This improved efficiency gives us a comparative figure of 5.8d. for coal and 6.28d. for gas for every therm actually employed—coal, that is to say, is under 8 per cent less costly than gas as a fuel. This is easily compensated for by the many advantages attached to the use of gas.

We may roughly divide the industrial users of gas into the three classes I have mentioned:

1. The industries in which the use of gas presents such advantages that cost does not seriously matter.
2. The industries in which fuel cost is an item, but where consideration of transport, storage, ground space, labor and the advantages given by a gaseous fuel are prominent.
3. The industries in which fuel cost is a major item.

I estimate that it would pay the industries to use gas in case 1 at a price per therm from ten to twenty times that of raw coal per therm; in case 2 at a price per therm from five to ten times that of coal; and in case 3 at a price per therm from three to six times that of coal.

There are not many instances of gas being supplied at the low price of 4.4d. per therm. The problem is, therefore, how to reduce the price of gas elsewhere. The first way is by increasing consumption. The output of towns' gas could be increased many times with a resultant lowering in price, if it were used in those cases where a direct financial saving is proved. Publicity is all that is required and gas undertakings are alive to the situation.

Special Rates to Large Consumers

A further necessity is to lower the price of gas by special rates to large consumers. In many instances in this country a sliding scale exists and the extension of such arrangements would undoubtedly result in greatly increased consumption of gas. In America gas is far dearer than in this country, but the labor conditions have forced to the front the economies to be attained, and consequently gas is used for major heating processes in industry even at a price of 1s. and more per therm. Many householders are using gas, at this price and over, continuously for central heating, under the conditions of the long winters and find an overall saving by so doing.

In conclusion, I may say a word on national policy. Throughout our industrial centers there are often large quantities of coal gas from coke ovens going to waste or being used uneconomically; some broad national scheme should be formulated to make this gas available for distribution. There is a multiplicity of gas undertakings, with the natural increase in overhead charges; a combination of these would result in great economies and the lowering of the price of gas. During the war the government realized the necessity for some co-ordination of power supply in order to reduce the cost of electricity, and as an outcome of this the Electricity Commissioners were set up, with resulting benefit to the nation. The government, however, was timid and not sufficiently farseeing. A commission for heat, light and power should have been instituted to examine and organize the conservation of our fuel resources and advise as to the best steps to be taken for the benefit of industry from all points of view. Such a commission could consider and help to fruition schemes for the linking up of existing supplies, the saving of gas now wasted, the reduction of stand-by plants and the reduction of overhead expenses.

One of the most fruitful studies for the reduction of

Abstracted from a paper read by Sir Arthur Duckham at the World Power Conference, Wembley, London, England, July, 1924.

manufacturing costs is the co-ordination of gas and electricity supplies. The time will come when practically no raw coal will be consumed. One of three methods will be followed:

1. The gas undertaking may receive and treat the fuel in order to recover the byproducts and turn over the residue to the electricity undertaking in the form of coke or gas for the generation of electricity by either steam or gas engines;

2. The electricity undertaking may first treat the fuel and turn over to the gas undertaking the gas for distribution and possibly the other byproducts for further treatment; or

3. Coke ovens may treat the coal and provide coke and gas to the electricity and gas undertakings.

The closer the producers and distributors of gas and electricity can work together the better for the country. Co-ordination is required, and I welcome this World Power Conference as the first occasion in this country when common cause has been made by the two great industries for the common good.

Water Dispersion of Rubber Is Now Used Commercially

Since the publication in *Chem. & Met.* of the outline of the Pratt patents for the water dispersion of rubber (see vol. 30, No. 10, March 10, 1924, p. 410) this process has been reduced to practical applications in a number of industrial lines. The economic and technical importance of water dispersions is constantly becoming more evident as their study and development proceed. In fact, the *India Rubber World*, in its current issue, points out that water dispersion may eventually supersede the use of solvents for many technical purposes and become an industrial factor of exceeding importance.

What takes place when a mass of rubber is dispersed in water is indicated by picturing the conditions as follows: Crude rubber may be considered to consist of massed minute shrunken globules with shriveled exteriors, interlocked and cemented together by non-rubber substances. It is comparable, by way of illustration, with a mass of dried prunes. As in the case of the latter, the rubber globules can be pulled apart, separated and dispersed under conditions that allow the entrance of water to swell the rubber globules and break the cohesive or binding force of the cementing non-rubber materials.

Absorption of water is effected by means of a suitable water carrier mixed with the rubber. Glue or colloidal clay functions effectively to convey the water into rubber and disperse the rubber globules under suitable mechanical treatment.

Very many successful water dispersions have been made experimentally of pure rubber and rubber compositions containing the usual compounding ingredients, substitutes, hydrocarbons, softeners and fillers in great variety. Also a beginning has been made in actually applying water dispersions in the manufacture of certain lines of rubber goods. Naturally the use of rubber dispersions on the spreading machine was first attempted. The preparation and use of water-dispersed rubber mixings is now in daily routine factory practice for certain proofed fabrics and surface coating of adhesive tape. In the latter instance glue is incorporated with rubber and reclaim in the mixing. In certain Eastern rubber factories water dispersions of rubber are being made and used in routine manufacturing procedures described in the following details:

The warm batch is milled with a little water in an inclosed mixer of the familiar horizontal type with two revolving blades, the action of which does not masticate the rubber but subjects it to a pulling or stretching effect. This process is continued for a brief period until the warm rubber shows indications of shortness as distinguished from toughness. At this point definite additions of warm water and soap bark extract are made, continued at frequent intervals as the liquid enters the rubber. The function of the soap bark extract is to break the surface tension of the water and facilitate its absorption by the rubber. After a short mixing the rubber assumes a soft, putty-like consistency. Further mixing and the addition of more water rapidly reduces the dispersion to a smooth cream containing about 40 per cent of water and 60 per cent of rubber composition. A dispersion of this sort is made in about 30 minutes and can be thinned subsequently with water to any desired concentration.

Naturally, water dispersions made by use of glue and soap bark have their technical limitations. While applicable to tape surfacing, cheap proofing, etc., they evidently are not suitable as frictions for belting or tires. In dispersions intended for friction purposes colloidal clay is substituted for glue and soap bark. The proportion of clay used is regulated according to the rubber content of the batch. Excess of clay over the amount needed is avoided, since the only function of the clay is to lead the water into the rubber batch. The amount of clay for dispersion of a given stock is determined experimentally according to the special conditions encountered. Its proportion may vary up to 10 or 12 per cent on the rubber present. Clay is equally as effective as glue in water dispersions and soap bark is not required with it. Not every clay is adapted to the work; thus far only the colloidal variety known as bentonite has been found suitable. Water dispersions are made with equal facility using either glue and soap bark or clay.

Manufacturing possibilities of water dispersions of rubber are evident in leather shoe work now using 100 or more solvent-containing rubber cements for which water dispersions may be substituted. In the paint-manufacturing industry water dispersions have already shown startling results experimentally, eliminating turpentine.

Tests Announced for Road Materials

Tentative standard methods of sampling and testing highway materials have been adopted by the American Association of State Highway Officials and have been approved by the Secretary of Agriculture for use in connection with federal aid road construction. These are announced by the United States Department of Agriculture in the Department Bulletin 1,216, recently issued.

Methods in the bulletin include those for bituminous, non-bituminous and metallic materials, as well as drain tile, culvert pipe, etc. Mechanical and chemical testing, as well as visual inspection, is provided for in the majority of cases.

Progress in Absorption

Review of the Papers Presented at the Symposium on Absorption at the Ithaca Meeting of the American Chemical Society, September 11, 1924

By W. G. Whitman

Massachusetts Institute of Technology. Chairman, Absorption Symposium

THE general principles of gas absorption and their industrial applications form the basis for the program of the Absorption Symposium. Modern developments in absorption equipment have brought about a reduction in the size of apparatus and have increased operating efficiencies in many industries. Much more rapid advances may legitimately be expected as the result of a wider appreciation and application of the basic laws governing absorption processes. In particular, the efficiencies and capacities of any definite absorption device when used for different gases and the relative performances of different types of apparatus on the same gas are fundamental problems that must be solved by the application of theory.

There is a close similarity between absorption processes and the transfer of heat, and our more complete knowledge of the latter operation may be applied by analogy to the former. This is especially true in studying the effect of operating variables such as gas velocity, temperature and viscosity.

The first paper on the symposium program discusses the general principles of absorption, treating specifically the effects of gas solubility and type of apparatus on the absorption characteristics. The next four papers deal with experimental investigations of absorption rates covering a wide range of gases and conditions of operation. These experimental studies are followed by two papers that discuss problems in the absorption of gasoline from natural gas and the removal of hydrogen sulphide from artificial gas, and by a final paper dealing with the determination of acid mists.

Principles of Gas Absorption. W. K. Lewis and W. G. Whitman—The rate of absorption is controlled in most cases by diffusion through the comparatively quiet surface films at the interface between gas and liquid. The general laws governing all such processes may therefore be applied to the flow of material from gas into liquid by diffusion through two films in series—first through the gas film and second through the liquid film. Rate of absorption per unit area equals diffusion coefficient for gas film multiplied by difference in partial pressure across gas film and also equals diffusion coefficient for liquid film multiplied by difference in concentration across liquid film.

The solubility of the material markedly affects the diffusion rates by determining the magnitude of the concentration gradient through the liquid film. In the case of gases of low solubility, diffusion through the liquid film is slow, because only small concentration gradients can be established. The resistance offered by the gas film is therefore so small compared with the high resistance of the liquid film that the absorption rate is almost entirely determined by liquid film diffusion. With very soluble gases the reverse is true and the absorption is controlled by diffusion through the gas film. This is because the diffusing material has such an affinity for the liquid solvent that it is rapidly sucked in through the liquid film when it reaches the interface, the rate therefore being dependent only upon the speed of diffusion through the gas film to the interface.

A comparison is made between types of apparatus in which the gas is passed over a free liquid surface with those in which gas is bubbled through the liquid. It is shown that the former type is adapted to the absorption of very soluble gases, whereas the latter is more efficient for the less soluble ones. Certain published data on absorption rates are analyzed which confirm the authors' concepts.

The Mechanism of Absorption of Moderately Soluble Gases in Water. H. G. Becker—The author reviews his earlier work on the absorption of atmospheric gases by water. Higher absorption rates per unit area are obtained from gas bubbles than from gas passed over a water surface, even when the latter is subjected to violent stirring. The results confirm the concept that liquid film diffusion controls the absorption of these relatively insoluble gases and show that the absorption rate is proportional to the degree of unsaturation. The higher rates obtained with gas bubbles are due to the very thin liquid films at the liquid-gas surface.

Recent experiments on the absorption of various pure gases (H_2, NO, Cl_2, H_2S, SO_2, HCl and others exposed above a practically quiescent water surface show a marked tendency for stratification in the liquid under these conditions. The degree to which stratification affects the results is apparently a function of viscosity, density, surface tension and heat of solution. The initial rates of absorption, before stratification complicates the problem, are, however, somewhat proportional to the solubilities of the various gases, thus concurring with earlier conclusions. This work illustrates the difficulties encountered in treating the special case of absorption in a very quiescent liquid.

A Study of the Mechanism of Absorption. R. T. Haslam, R. L. Hershey and R. H. Kean—The effects of gas velocity and of temperature on the rates of absorption of sulphur dioxide and ammonia by water are investigated over a wide range. The apparatus consists of a vertical glass column with the gas-air mixture admitted at the bottom and water flowing down the sides. This type of apparatus corresponds more closely to a gas bubble rising through water than to a gas passing over a horizontal liquid surface.

Sulphur dioxide is absorbed almost as rapidly as am-

monia, although its solubility is less than one-tenth as great. The authors show that this is due to the resistance to diffusion offered by the gas film, which becomes more marked with the ammonia, because the gas film resistance is more important with the more soluble gas.

Increased gas velocity thins down the gas film at the surface and thereby raises the rate of absorption. This effect is more marked with ammonia than with sulphur dioxide, since, as was noted above, the gas film resistance is more important in the absorption of ammonia. Variations in gas velocity have very little influence upon the liquid film in this apparatus.

Increase in temperature decreases the absorption rate, mainly because the solubility is lessened. The rate of absorption coefficient for the liquid film, however, increases with temperature, due to increases in the ratio of fluidity to density of the liquid and in specific diffusion rates. This effect is more pronounced with sulphur dioxide, because the primary influence of temperature is on the liquid film.

The results of this work are shown to be in general agreement with the absorption theory outlined in the first paper.

The Absorption of Carbon Dioxide and Ammonia From Gas Bubbles. P. G. Ledig—The author studies absorption rates from gas bubbles by measuring the decrease in the total pressure of the liquid-gas system as absorption proceeds. The data are taken by photographing the surface of the liquid in the pressure manometer on a rotating drum, which thus gives a continuous record of the progress of absorption.

The absorption of bubbles of CO_2 in potassium hydroxide solutions shows that the rate is greater in potassium than in sodium hydroxide. The rate increases regularly with increasing concentration of alkali and a very marked increase is noted above 10 normal. In direct contrast, the author's earlier work on sodium hydroxide had shown a decreasing rate as the concentration was increased above 3 normal.

Ammonia bubbles are absorbed so rapidly that modifications in the experimental method were required. Ammonia is absorbed in 5 normal ammonium hydroxide almost as rapidly as in pure water, but the rate decreases above this concentration and falls to a comparatively low figure at 15 normal. This would, of course, be expected, since a 15 normal liquor is about half saturated with pure ammonia at 1 atmosphere.

This experimental method is unique in that it studies the progress of absorption from a single gas bubble and indicates how the conditions at the bubble surface change during the process.

Comparative Absorption Rates for Various Gases. W. G. Whitman and D. S. Davis—Data are presented on absorption rates for O_2, SO_2, NH_3 and HCl in water and for NH_3 in hydrochloric acid solution under similar conditions of operation. The method consists of passing a mixture of the gas and air over the surface of the liquid, the liquid being slowly agitated by a stirrer.

These gases differ greatly in solubility and the actual absorption rates vary forty thousand-fold. An analysis of the data is made on the basis of the two-film theory by assuming that oxygen absorption is controlled entirely by liquid film diffusion, while the absorption of NH_3 in hydrochloric acid is limited only by diffusion through the gas film. Using only the data for these two sets of experiments, the authors calculate the absorption rates to be expected for SO_2, NH_3 and HCl in water. The calculated results check within 15 per cent of the experimental in all three cases. The absorption of the less soluble gases, O_2 and SO_2, is not so rapid in this apparatus as in the apparatus used by Haslam, Hershey and Kean, because the liquid film is thicker despite the agitation caused by the stirrer. It is concluded that the absorption of SO_2 in this apparatus is controlled almost entirely by liquid-film diffusion, that the absorption of HCl is substantially limited by gas-film diffusion and that both films are of about equal importance in the absorption of NH_3 in water.

A few experiments on negative absorption (air passed over concentrated solutions of sulphur dioxide) bring out three points regarding the liquid film. In the first place, the diffusion coefficients are essentially the same as those obtained in positive absorption under similar operating conditions. Second, the rate of absorption increases with the speed of stirring. Finally, increasing the viscosity of the solution threefold by the addition of glycerine reduces the diffusion coefficient by 60 per cent.

The Absorption of Gasoline From Natural Gas. R. P. Anderson—The absorption of gasoline from natural gas is complicated by the fact that undesirable hydrocarbons of high volatility (fixed gases) are absorbed together with the less volatile constituents of the gas. The presence of these fixed gases makes it difficult to condense the product after it has been driven out of the absorbing material. The conditions for most effective operation must therefore consider the efficiency of recovering the gasoline after absorption as well as the absorption process itself.

In the oil absorption process absorbent oil is pumped through towers, where it picks up the gasoline together with certain amounts of fixed gas. The enriched oil then passes to a heated still, where the gasoline and fixed gases are driven off and carried over to a condenser, the oil being returned to the absorption system. Counter-current flow of gas and oil through several towers permits a high absorption efficiency and cuts down the ratio of fixed gas to gasoline absorbed. Since the absorption is usually carried out under pressure, it is possible to "vent" off some of the fixed gas in the enriched oil by reducing the pressure before the oil reaches the still.

In the charcoal process there are three absorption tanks filled with activated coconut charcoal. These absorbers are operated in rotation, the natural gas passing through two of them in series, while the third is being steamed out to drive its absorbed gasoline over to the condenser. A high ratio of gasoline to fixed gas is obtained by continuing the absorption for a considerable period before steaming. The condensation of still gas is accomplished by cooling and compression, and final weathering of the gasoline is necessary to remove the excess of fixed gases in the condensate. Recent improvements in this last operation involve the application of the principles of fractional distillation to avoid loss of gasoline.

The Absorption of Hydrogen Sulphide. F. W. Sperr, Jr.—The removal of hydrogen sulphide from artificial gas is generally effected in purifiying boxes con-

taining hydrated iron oxide. A new process of liquid absorption has recently been developed to replace wholly or in part the dry purification and its attendant disadvantages, such as excessive ground area, high labor requirements and impracticability of purifying under high pressure.

This process, which is now operating in a number of water-gas and coal-gas plants, employs dilute sodium carbonate solution in a packed scrubbing tower. The process is continuous, the hydrogen sulphide being absorbed from the gas by the sodium carbonate liquor in the upper half of the tower (the absorber), and removed from this liquor in the lower half (the actifier) by blowing air through it. The actifier liquor from the bottom of the tower is then pumped back to the top of the absorber.

The process is dependent upon the reversibility of the absorption reaction:

$$H_2S + Na_2CO_3 = NaHS + NaHCO_3$$

H_2S is absorbed from the artificial gas, producing the acid sulphide and bicarbonate. In the actifier the reaction is reversed because H_2S can readily escape into the air which is blown through. Carbon dioxide is also absorbed with the H_2S, producing more bicarbonate and assisting in the actification by increasing the concentration of bicarbonate.

The process is ordinarily operated to remove 85 to 90 per cent of the H_2S, the remainder being taken out by iron oxide in the usual way. The capacity of an existing purification system is more than doubled by the installation of liquid absorption in front of the dry purifiers.

The amount of sodium carbonate consumed by side reactions and mechanical losses is small, averaging about 1 lb. of soda to every 8 lb. of H_2S removed.

The Analysis of Mists and Fogs. H. C. Weber—The author describes three successful methods for the determination of mists that are encountered in the absorption of acid gases. The mists cannot be effectively absorbed by ordinary bubbling through a ilquid, because the protective gas film around each particle of mist prevents good contact between the mist particles and the liquid absorbent.

The first method involves the use of a porous membrane such as an alundum thimble immersed in a liquid absorbent. The membrane acts as a mist filter that retains the solid or liquid particles so that they may be taken up by the liquid.

The second method uses a dry porous membrane, preferably a mat of filter papers clamped between glass flanges. After filtration of the mist, the papers are dropped into water and titrated. Data are given on the efficiencies and capacities of such filters for absorbing sulphuric acid mist. It is shown how the size of mist particles may be estimated by using two or more filters in series and determining the relative amounts of mist absorbed on each.

The third method employs electrical precipitation by the Cottrell system and is especially adapted for nitric acid mists. The precipitation chamber is a lead-glass tube wrapped with a copper foil electrode and with a platinum wire electrode through its central axis. The apparatus is portable and can be operated at comparatively low potentials (1,100 to 1,300 volts) secured from a 6-volt storage battery with a Ford spark coil.

Cane Sugar Production Increasing

The Department of Commerce announces that, according to reports for the biennial census of manufactures, 1923, the establishments engaged in the refining of cane sugar in that year produced 4,429,128 tons of refined cane sugar, valued at $722,278,797; 21,947,183 gal. of sirup, valued at $1,896,114; 19,149,380 gal. of molasses, valued at $1,441,012; and other products to the value of $625,654, making a total of $726,241,577. The rate of increase in this total as compared with 1921, the last preceding census year, was 55.6 per cent.

The quantity of raw sugar melted during 1923 was 4,733,217 tons, comprising 3,984,110 tons of foreign and 749,107 tons of domestic (including Hawaiian).

Of the twenty establishments reporting for 1923, five were located in New York, four in Louisiana, three in Pennsylvania, two each in California and Massachusetts, and one each in Georgia, Maryland, New Jersey and Texas.

The statistics for 1923 and 1921 are summarized in the statement below. The figures for 1923 are preliminary and subject to such corrections as may be found necessary upon further examination of the returns.

	1923	1921	Per Cent of Increase (*a*)
Number of establishments	20	20	....
Materials:			
Cost (including fuel and containers)	$681,880,139	$426,600,908	59.8
Raw sugar treated, total (tons of 2,000 lb.)	4,733,217	(*b*)	....
Domestic (includes Hawaiian)	749,107	(*b*)	....
Foreign	3,984,110	(*b*)	....
Value of products, total	$726,241,577	$466,602,352	55.6
Refined sugar:			
Tons (2,000 lb.)	4,429,128	3,770,163	17.5
Value	$722,278,797	$462,325,142	56.2
Sirups:			
Gal.	21,947,183	23,802,549	—7.8
Value	$1,896,114	$2,478,315	—23.5
Molasses:			
Gal.	19,149,380	15,045,350	27.3
Value	$1,441,012	$796,453	80.9
All other products, value	$625,654	$1,002,442	—37.6
Value added by manufacture (*c*)	$44,361,438	$40,001,444	10.9
Horsepower	72,682	(*b*)	....
Coal consumed (tons of 2,000 lb.)	982,652	(*b*)	....

(*a*) A minus sign denotes decrease. (*b*) Not reported. (*c*) Total value of products less cost of materials.

Bureau Helps Explode Copper Myth

Since the recent newspaper story of the wonderful discovery of "the lost art of hardening copper" by an automobile mechanic and the immediate sale of the "secret" for an unbelievable sum (cash in hand), the Bureau of Standards has received numerous inquiries concerning this and similar processes. From a set of samples submitted by one party, undoubtedly prompted by the newspaper story referred to, a typical piece was selected for examination as an example of the line along which such "inventors" work.

The chemical analysis showed the following results: Copper, 91.7 per cent; aluminum, 7.8; manganese, 0.26; lead, 0.10; iron, less than 0.10.

It is evident from this that the "hardened copper" was merely an aluminum bronze—an alloy known for many years and having considerable use at present. In addition the attempt had been made to "stiffen" and harden the material by rolling. The result, however, was decidedly inferior to what would be considered even fair commercial practice.

In general it may be said that present-day metallurgists are quite familiar with the general means which may be used in hardening copper or other metals. Essentially they are chemical in nature (alloying additions) or physical (cold-working) or combinations of these two methods.

What Is the Most Suitable Filter?

Editor's Note: At our request several engineers and filter manufacturers have discussed Mr. Sperry's article and their discussion follows it. We believe that the symposium is a distinct step in the direction of an intelligent approach to the problem of buying commercial filters

By D. R. Sperry
D. R. Sperry & Co., Batavia, Ill.

TO DEAL with this subject intelligently it is necessary to start out with a few definitions in order that the terms used may be understood. The writer defines filtration as follows: "Filtration is the process of separating a mixture of solids and fluids by causing the fluids to pass through a continually increasing porous mass, the openings of which are too small to permit passage of the solids." In order to start the process of filtration there must be a porous mass that will initiate the deposition of solids. This initial porous mass, usually cloth, paper or pulp, is called the "filter base." The porous mass, consisting of continually increasing deposited solids plus the filter base, is called the "filter medium." Since the flow of the fluid is caused by a difference in pressure between the two sides of the filter medium, it follows that a support must be provided for the filter base; this is called the "fiilter support," usually a filter plate or screen. The apparatus in which the process of filtration is carried on is called a "filter."

In considering these definitions it should be borne in mind that fluids are not necessarily liquids and that solids are not necessarily rigid particles, the terms being used as defined in Webster's Dictionary. This definition therefore includes the separation of solids from gases as well as solids from liquids.

This article deals with filters in which solids are separated from liquids, six principal kinds being considered. Anyone with a problem in filtration to solve may be confused with regard to the filter that should be used. The purpose of this article is to aid in arriving at an intelligent selection of a filter.

There are many different kinds of filters, but only the most common types will be taken up. It is possible to divide these filters roughly into six classes as follows:

Open Filters

Open filters are stationary filters in which the space above the mixture is open to the atmosphere.

Gravity Open Filter—The most commonly known example of this type is the ordinary laboratory funnel filter. The gravity open filter is operated entirely by gravity. A commercial gravity open filter may be defined as a tank with a drained false bottom over which a filter base is distributed. It is primitive and is certainly the simplest form of filter. Operation of this filter is as simple as the filter itself. The mixture to be filtered is placed in the tank and the static head of the mixture causes filtration. These filters may employ any of the known filter bases, but more especially cloth, paper, pulp or asbestos. The tank may be made of wood, earthenware, metal, glass, etc., as may be dictated by the mixture to be filtered.

Suction Open Filters—The suction open filter is quite similar to the gravity open filter except that suction is applied behind the filter base, thus adding to the static head of the mixture an additional head due to the atmospheric pressure. The filter bases employed and the materials of construction used are the same as in the case of the gravity open filter. The filtrate flows either into a receiver under reduced pressure or else passes through the vacuum-producing device.

Leaf Filters

Leaf filters are stationary multiple filters in which the margins of adjacent filter bases are not pressed upon to form chambers.

Suction Leaf Filters—This type of filter consists of a cluster of filter leaves, somewhat like those found in the pressure leaf filters, that can be lowered into a tank containing the mixture to be filtered. Suction is then applied to the interior of the leaves, inducing filtration and the formation of a cake on the exterior of the leaves. If it is desired to wash the cake, the entire cluster of leaves is lifted bodily from the tank containing the mixture and placed in another tank containing the solvent. Suction is again applied to the interior of the leaves until sufficient solvent has passed through to complete washing. The leaves are now lifted clear of the solvent tank and suspended in the air above the point where it is desired to drop the cake. Suction may be maintained for awhile to remove part of the moisture from the cake. Compressed air is then introduced in the interior of the leaves, causing the cake to fall from the leaves. If needed, manual assistance may be given to free the cake from the filter base.

Pulp Filters (a disk pressure leaf filter)—In pulp filters the filter base consists of pulp. Disks of the

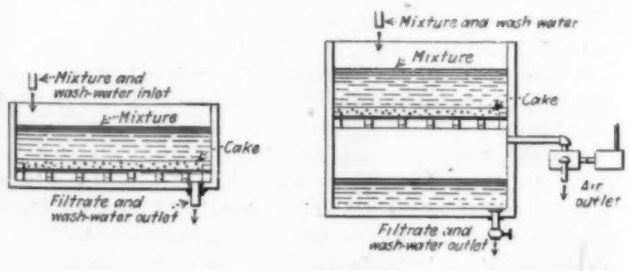


Fig. 1—Open Filters
The illustration at the left is a simple gravity open filter, the most elementary type of industrial equipment. The right-hand figure is a suction open filter, differing only in that a vacuum chamber is added.

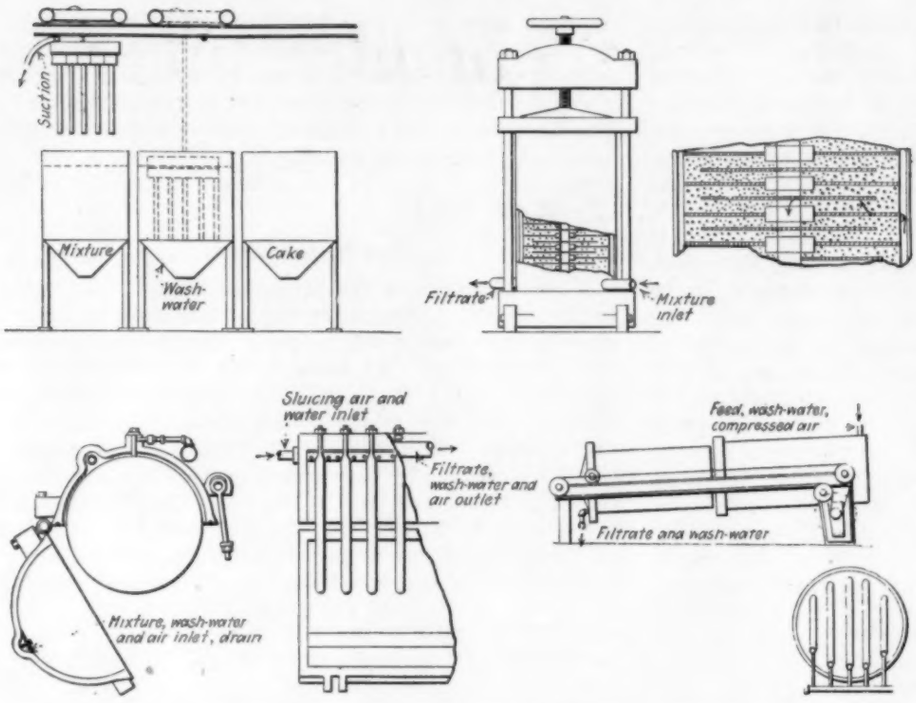


Fig. 2—Leaf Filters

The four types of leaf filters differentiated are pictured in the accompanying diagrams. Above on the left is the simple suction leaf filter, showing how the filter unit may be moved to the washing tank and to the cake discharge hopper. The upper right-hand picture shows the pulp filter, which was used so extensively on clarifying beer before prohibition and now finds use in fruit juices and gelatine. It is of use only when the percentage of solids is low. The lower left-hand diagram shows a pressure leaf filter like the Sweetland, and the lower right is a suction leaf filter like the Kelly, both well known in industrial work.

pulp are formed in a pressing device. In the middle of each disk parallel to the flat faces is placed a wire screen which does not extend to the outer edges and which has a circular hole in the center. These disks are then piled one on the other, with screens placed between them. Each of the separating screens has a metallic boss at the center which projects about half way to the center of each pulp disk. These bosses fit snugly into the pulp, compressed especially about the central hole. The entire column of pulp disks and screen separators are inclosed in a shell. The mixture to be filtered is fed into the shell, passes into the spaces between the disks, enters the pulp and reaches the central channel by way of the screens imbedded in the center of each disk. The filtrate leaves by way of the central channel formed by the holes in the screen bosses. Pressure is supplied by gravity, pump or montejus. When the pulp filter bases become clogged or if for any other reason it is desired to renew the filter base, the disks are removed from the machine, the pulp is removed from the disks, washed, repulped and again formed into disks to repeat the cycle.

Pressure Leaf Filter Disk and Rectangular Types—In general the pressure type consists of a vessel in which are suspended a number of leaves consisting of a filter support surrounded by a filter base; the filter support is usually made of heavy screening, while the filter base is usually cloth. Pressure applied to the material to be filtered in the vessel brings about filtration and a deposit of cake upon the leaves. If it is desired to wash the cake upon the leaves, the pressure vessel is filled with wash water, the original mixture being displaced by compressed air so as to maintain constant pressure during the operation in order not to disturb the cake. After washing, the excess water is drained off, and if desired, compressed air may be blown through the cake to aid in removing moisture. Next the pressure vessel is opened, the suspended leaves exposed and the cake removed either by scraping or by admitting compressed air behind the filter base, or by both methods. The pressure vessel is usually cylindrical in shape, the axis being in the horizontal position. There are two types, one in which the leaves are circular in shape and are suspended at right angles to the axis, and the other in which the leaves are rectangular and are suspended parallel to the axis. In the first case the leaves are exposed by dropping the lower hinged half of the cylinder; in the second, one end of the cylinder is pulled out, carrying the suspended leaves with it.

Rotary Filters

Rotary filters are rotating filters in which centrifugal force is not employed. There are two general kinds—the cylindrical and the disk; both may be suction or pressure type.

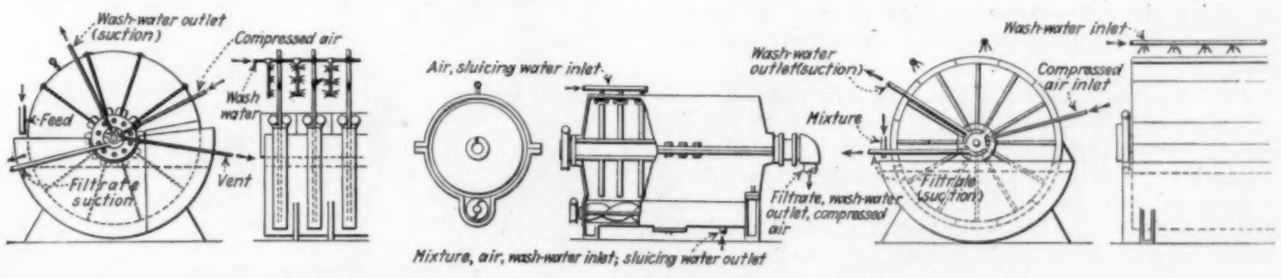


Fig. 3—Rotary Filters

Three main types of rotary filters are differentiated. At the extreme right is a diagram of a rotary suction filter, of which there are several successful types on the market. The illustration on the left is a rotary disk filter like the American Continuous Filter, and the one in the center is a pressure disk rotary filter like the Vallez, though this can also be used as a suction filter.

Cylindrical Suction Rotary Filter—In the cylindrical suction type the filter medium is carried on the outside surface of a drum, which is partly immersed in the mixture to be filtered. Suction is applied to the interior of the drum, sometimes to the entire interior, but usually to separate compartments immediately behind the filter base. The drum slowly rotates, thus dipping successive portions of its exterior into the material to be filtered. In the compartment type the suction is applied at first only to those sections actually immersed. As each compartment rises from the material to be filtered, other connections may be made with the exterior by a suitable valve located at the center of rotation at one end of the drum. By means of this valve, wash-water (which has been sprayed on the exterior of the cake) may be drawn off and diverted where desired. Later the same compartment may be supplied with suction alone to aid in drying the cake, and still later the suction may be replaced with air pressure to assist in removing the cake from the filter base. A scraper running the length of the drum, together with compressed air supplied within the compartment under the scraper, causes removal of the cake.

Disk Suction Rotary Filter—The principles actuating this machine are very similar to those of the cylindrical suction type. In this case the drum is replaced by a shaft on which is mounted a number of disks. The shaft and disk rotate as did the drum and each disk is divided into compartment segments in which, by means of a valve, suction or compressed air may be applied at will. Removal of cake is assisted by rollers to which the cake sticks, so that it may be scraped from the rollers if needed. Compressed air also aids cake removal.

Disk Pressure Rotary Filter—In this type of filter the filter base is in the form of a number of circular disks mounted upon a rotatable shaft. The whole is incased within a cylinder. The material to be filtered is pumped into the cylinder and the cake deposited upon the disks. Drainage for the filtrate is through the hollow center of the rotating shaft. Filtration may be followed by air pressure in the cylinder, and dislodgement of the cake may be assisted either by introducing compressed air into the interior of the shaft and behind the filter base, or it may be sluiced off by water or air by means of jets within the cylinder. Washing may be done by pumping water into the cylinder and allowing it to pass through the cake and out by the hollow shaft. The filter leaves are rotated to cause even deposition of cake and to assist in sluicing and removing cake. A screw at the bottom of the cylinder moves the fallen cake to the outlet.

Squeezing Filters

A characteristic of the squeezing filter is two heavy heads or platens, pivoted on supporting links and made movable by means of a hand- or power-operated hydraulic cylinder. By means of the hydraulic cylinder and the linkages the platens are separated from one another, but with their lower edges quite close to one another. In this position filter bags, separated from one another by corrugated spacers, are suspended from the supporting bars at the top. Then, if the bags are open at the bottom, they are sealed shut by bringing the lower edges of the platens still closer together by means of a long screw and handwheel. Into the interior of the bags is pumped the material to be filtered. The pressure is necessarily low at this stage, as the bags are practically unsupported. The next step is to crack the needle valve on the hydraulic cylinder. This gradually allows the piston to descend and the weight of the platens is gradually applied to the bags. When the platen faces are parallel to one another, the squeezing pressure is at its maximum. The bottom edges of

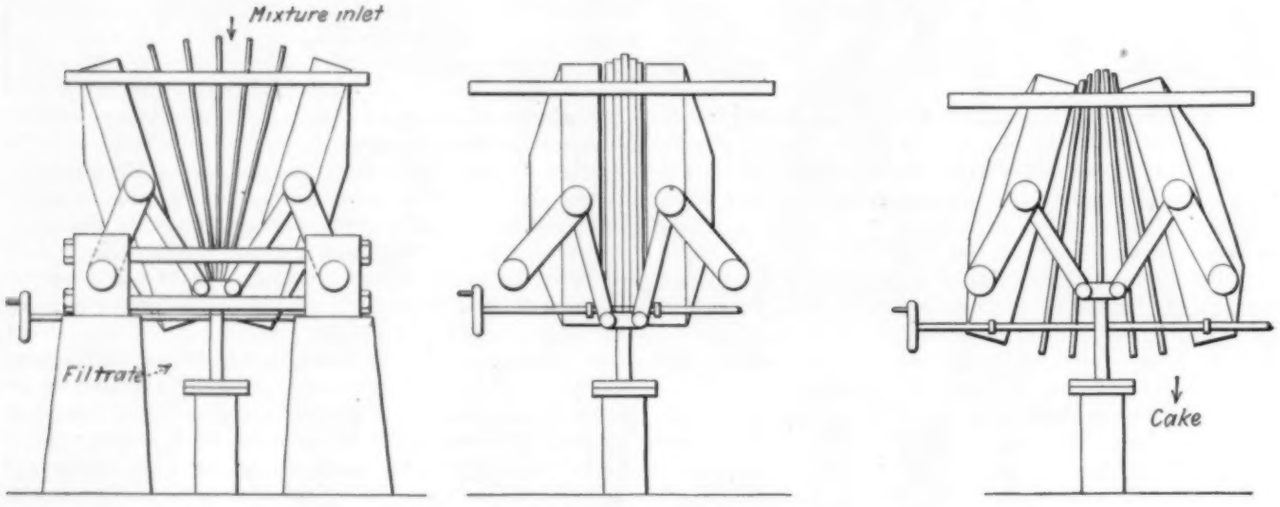


Fig. 4—Squeezing Filters

This is one type of squeezing filter, though there are other types in which the platens are kept parallel to one another and the squeezing takes place in either a horizontal or vertical plane. Such filters are usually classed as hydraulic presses, though they are just as truly filters as any of the other types.

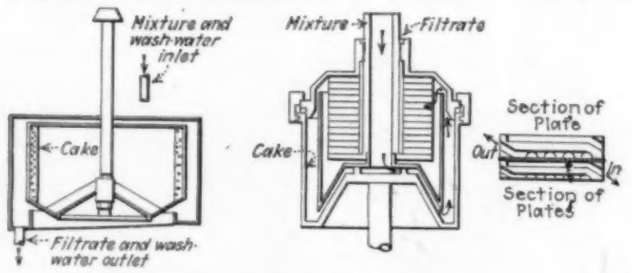


Fig. 5—Centrifugal Filters

The left-hand diagram shows the ordinary sugar centrifugal. The illustration on the right shows a filter of special design with a positive feed pressure accomplishing the filtration ended by centrifugal force.

the platens are now separated simultaneously with the raising of the piston in the hydraulic cylinder. At the end of the stroke the bags are cleaned of their contents or removed as the case may be.

Centrifugal Filters

Centrifugal filters should not be confused with centrifuges. The latter employ the process known as sedimentation, accelerated by centrifugal force. In the former the process of filtration is carried on, the filtering process being produced or aided by centrifugal force. In one form of centrifugal filter the basket has sides that form a drained filter support covered with a filter base. The ordinary sugar centrifugal used for separating sugar crystals from molasses is an example. In another type the material to be filtered enters the central opening, passes to the outer periphery, where certain of the solids remain, and thence to the pile of alternate filter papers and filter support disks. To get through these disks to the central annular outlet, the liquid must pass through the filter paper. The principal filtration pressure in this case is due to the static head and to the pressure with which the material is fed into the apparatus. Centrifugal force causes a partial separation of the solids by sedimentation and is also said to cause the solids deposited on the filter paper to be thrown off.

Plate Filters

Plate filters are those in which chambers are formed by pressing against the margins of adjacent filter bases. A plate filter may be roughly described as a press containing a number of plates, used as filter supports, over each of which is thrown a filter base, usually cloth. By means of the press these plates are squeezed together. The filter base acts as a gasket, and a chamber for collecting solids is formed by recessing the plates or by inserting spacing frames between the plates. The first kind is called the recessed plate filter press, while the second is called the flush plate-and-frame filter press. Thus it can be seen that the filter press does not squeeze the cake or the material to be filtered, but is a press for holding together the component parts of a filter.

When the filter press has been "set up"—that is, when the plates are all clothed and squeezed together—the material to be filtered is pumped into the filter

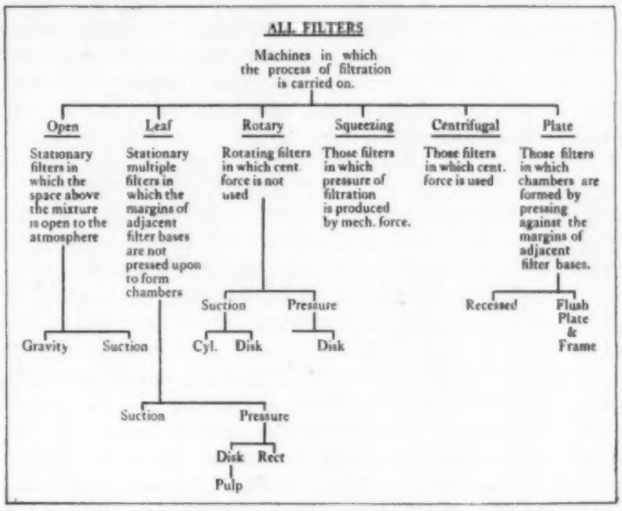

ALL FILTERS
Machines in which the process of filtration is carried on.
Open
Leaf
Rotary
Squeezing
Centrifugal
Plate
Stationary filters in which the space above the mixture is open to the atmosphere
Stationary multiple filters in which the margins of adjacent filter bases are not pressed upon to form chambers
Rotating filters in which cent. force is not used
Those filters in which pressure of filtration is produced by mech. force.
Those filters in which cent. force is used
Those filters in which chambers are formed by pressing against the margins of adjacent filter bases.
Gravity
Suction
Suction
Pressure
Cyl.
Disk
Disk
Recessed
Flush Plate & Frame
Suction
Pressure
Disk
Rect
Pulp

Fig. 7—Chart Showing the Various Classes and Types of Filters

through an opening in the fixed head. This opening communicates with a channel running the length of the filter, formed by holes or eyes in the plates. In the recessed type the holes are through grommets, which hold the cloth tight around the margins of the hole through the plate, thus connecting together all the chambers formed by the recesses in the plates. In the flush plate-and-frame type the holes forming the feed channel are eyes in the plates and frames, a connection or port being made from the eyes in the frames to the interior of the frames, thus causing the feed channel to communicate with all the chambers formed by the frames in the filter. As filtration proceeds, a cake is formed on the cloths, the filtrate leaving the plates by suitable outlets, and the process may be continued until the chambers are completely filled, or if desired the process may be stopped before the chamber is filled in order to wash the deposited solids by following up the feed with a solvent; this is called "simple washing." Washing is usually accomplished by filling all the chambers completely and introducing a solvent behind the filter base in alternate plates, closing off the filtrate drainage from such plates and leaving open the filtrate drainage in the remaining plates, the result being that the solvent must pass through the deposited cake and out the open drainage outlets. This is called "thorough washing."

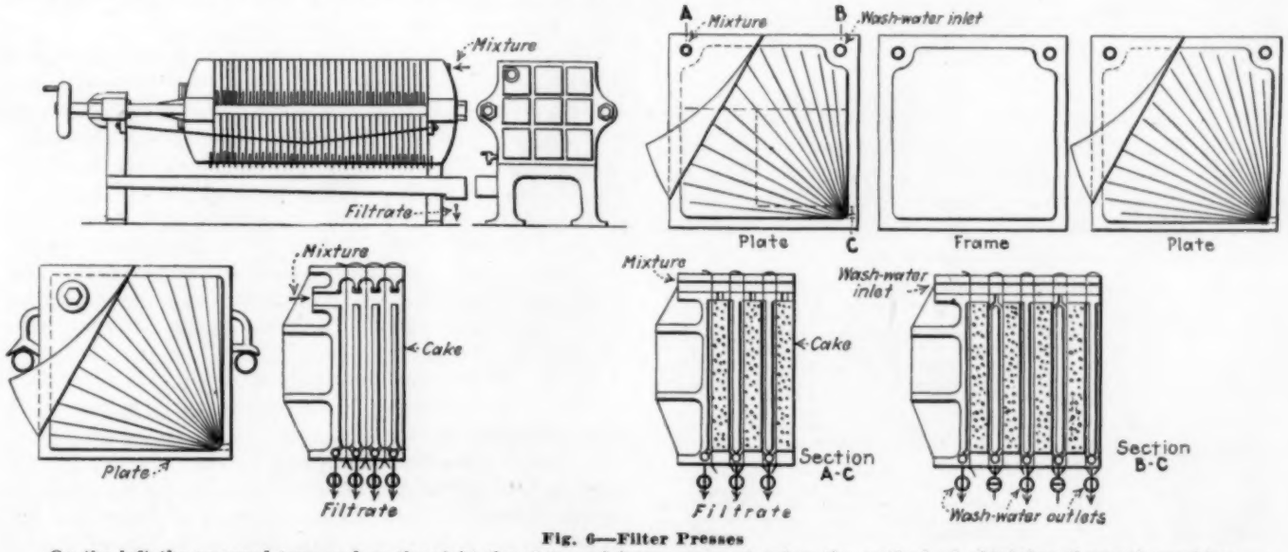


Fig. 6—Filter Presses

On the left the recessed type and on the right the plate-and-frame type, showing the method of obtaining thorough washing.

Classification of Filters—Fig. 7 is designed to give a broad view of the entire field of filters. These filters are in use today, with the exception of a few that are mentioned largely because they represent a type. Continuation of this classification may perhaps point the way to future development in filters.

What Kind of Filter Should Be Used?

Thus far practical filters have been named, described and classified, but no effort has been made to mention the conditions under which the different filters should be used, or their advantages and disadvantages. In order to supply this information, a table, Fig. 8, has been devised. In this table will be found a list of various conditions found in filtration, while opposite each condition will be found a check-mark under the type of filter in which that condition applies. The total number of check-marks under the other filters indicates the degree of versatility of that filter compared with the others. It does not necessarily mean that the filter with the greatest number of check-marks is the best filter, because the check-marks do not cover points of equal importance. Moreover, there is a variation of degree in which a given condition applies in each case. Taken altogether, however, the table gives a very comprehensive view of the uses and versatility of the various filters.

This table may be used in various ways. A study of the different kinds of filters may be made by calling the conditions opposite the check-marked spaces appearing under the name of the filter as advantages and considering the conditions opposite the open spaces as conditions not obtaining and therefore disadvantages. Studying the filters this way one may find one suited to the problem in mind. Another method of solving a problem is to list the conditions that must obtain for the material in question and then finding the filter under which those conditions are check-marked.

It should be remembered that the conditions marked under each filter are dependent upon the other conditions. For instance, we may find one marked "low labor cost per ton," but we find that this is obtained only in case the other marked conditions prevail; for example, there must be a "large tonnage of constant composition" and moreover the cake cannot be as dry as in other filters. In small batches it could not be obtained, nor if the cake is desired in molded form. In other words, in order to get the full meaning of any one of the conditions marked the others must also be studied.

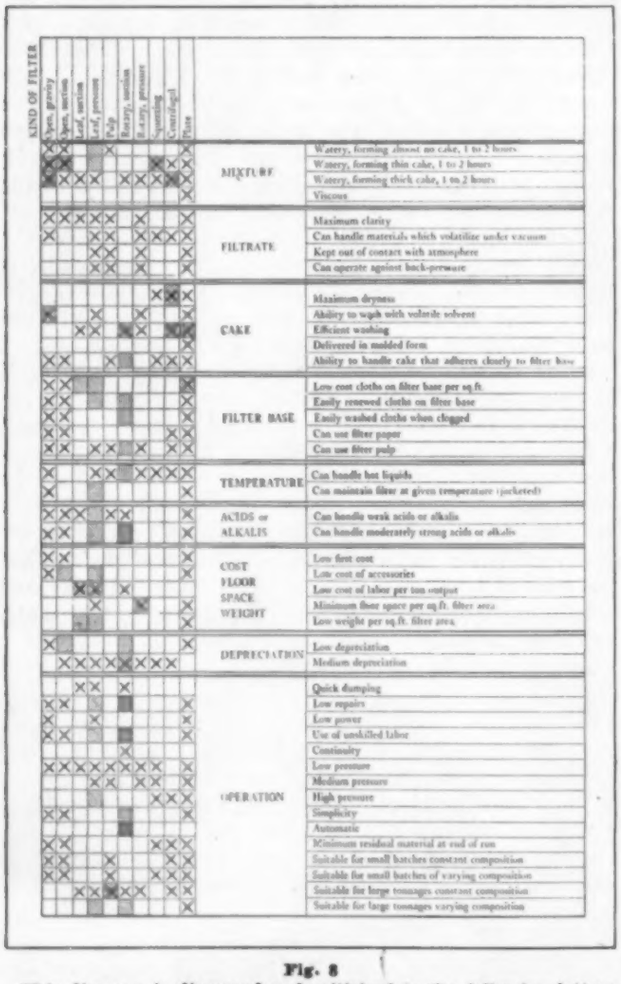


Fig. 8

This diagram is discussed and criticised in the following letters. As it was originally submitted by Mr. Sperry it contained all the crosses and no cross-hatching. Where squares are cross-hatched it indicates that one of the critics suggested a change—inserting a cross if none existed or deleting it if one was there in Mr. Sperry's original. Squares cross-hatched from left to right are changes suggested by Mr. Hoyt; those cross-hatched vertically are Mr. Mount's suggestions, and those cross-hatched from right to left are by Mr. Alford.

Most of the critics have seen the weakness of such a diagram and Professor Whitman summarizes the principal objection to it well when he says that it does not differentiate important from unimportant points. Nevertheless, with its weakness, we believe that it will prove helpful in bringing to the attention of engineers the many variables in filtration work.

Critical Discussion of the Foregoing Article

To the Editor of Chem. & Met.:

Sir:—After examination of Mr. Sperry's chart I realize the inadequacy of a condensed table for presenting a comparison of various types of equipment. Probably the chief difficulty in attempting an unbiased tabulated estimate is to select points of comparison which will be fundamental, comprehensive and yet incapable of misinterpretation.

Thus Mr. Sperry expresses the cost of cloth per square foot. Now the cost of cloth per square foot of filtering area may be slightly greater with leaf and rotary suction filters than with plate-and-frame presses, but the cloth cost *per day* is certainly higher for the plate-and-frame type, since cloth service is more severe. This consideration could be taken into account by introducing another factor, "Life of Cloth" or better still by substituting "Cloth Cost Per Square Foot Per Day" for "Cloth Cost Per Square Foot."

I would question the conclusion that leaf pressure filter cloths are not readily washed.

The table does not differentiate between acids and alkalis. There are filters—the pressure leaf filter among others—which will work satisfactorily in the case of alkali where they could not be used with acids.

It seems to me that the use of the term "depreciation" by Mr. Sperry is not wholly clear. It may mean actual depreciation cost in dollars for a given size installation, or on the other hand, it may mean length of life expressed as a per cent on the investment. I believe that the word is usually employed with the latter meaning, in which case the change in rating of the different types of equipment is necessary.

If Mr. Sperry includes the Vallez filter in his rotary pressure classification, I should not agree wholly with his estimates on this type.

There is one main objection to the table in that it does not differentiate between the important and the unimportant features. The low cost of labor per ton hour may be a very vital objection to the use of a filter

press, but it bears no more weight in this table than such an item as the possibility of using very high pressure. Such a lack of proper emphasis is confusing and fails to give a clear picture of comparative values.

WALTER G. WHITMAN,
Assistant Director, Research Laboratory of Applied Chemistry, Massachusetts Institute of Technology.
Cambridge, Mass.

To the Editor of Chem. & Met.:

Sir:—Your letter asking for suggestions or criticisms of the filtration chart has been received. While I am glad to do so, the correction of such a chart involves many technical considerations that cannot be adequately explained merely by check-marks. In fact, it is my opinion that unless a person endeavoring to use this chart is not already quite familiar with filtration practice it would be more apt to prove misleading than helpful. However, I shall do my best and have indicated in the squares cross-hatched from left to right the corrections that appear to me as most important.

Mixture—Watery, Forming Almost No Cake. I believe that "leaf, pressure" filter should be included, since the Sweetland filter, which is a typical example of this general type, is being widely and successfully used for clarifying metallurgical, chemical and other solutions carrying such a minute percentage of solids that filtration can be continued for many hours before it becomes necessary to stop and discharge the cake.

Mixture—Watery, Forming Thin Cake. The same remarks apply as in the case of the preceding classification.

Cake—Efficient Washing. While a properly designed "plate" filter will give good washing results on certain materials, there are many other materials, as well as some types of "plate" filters, with which it is impossible to secure anything but the poorest sort of a wash. Because of the direct replacement wash obtained in a properly operated "leaf" filter, this type will, in the majority of cases, show considerably better efficiencies both as to the solubles removed from the cake and quantity of wash water or solution used.

Filter Base—Low Cost Cloths on Filter Base Per Sq.Ft. If this refers solely to the first cost of cloths in place in the filter, this item per sq.ft. of filter area would usually be somewhat lower for "plate" filters than for the other types. What really counts, however, is the total cost of filter cloth per ton or other unit quantity of material filtered. When figured on the latter basis, "plate" filters will almost invariably show as high, and in the great majority of cases higher costs, than the other types discussed. The chief reason for this is the fact that in a "plate" filter the cloths must serve as gaskets between the machined metal surfaces surrounding the plates and frames. As these often have sharp edges or shoulders and at each filtering operation are forced together under tremendous pressure, the wear and tear on the cloth is correspondingly severe. With most of the other types considered, the cloth acts solely as a filter medium and the actual mechanical wear is greatly reduced. Since the capacity of a "plate" filter per sq.ft. of area is generally lower than the others, the net result in most cases is a substantially higher cloth cost per ton of material handled when "plate" filters are employed.

Filter Base—Easily Renewed Cloths on Filter Base. Extra filter cloths for practically all modern leaf type pressure filters are shipped from the factory all made up and ready to be placed on the leaves with a minimum amount of sewing. It is customary for the users of this type of filter to have a few extra leaves on hand, covered with fresh cloths, and these can be quickly inserted in the filter. While the use of "leaf" filters involves a certain amount of sewing in placing fresh bags on the extra leaves, this can be done without interfering with the operation of the filter. The actual difference in time required between putting new cloths on a "plate" filter and freshly covered leaves into a "leaf" type is so small as to be comparatively unimportant from a practical standpoint.

In a similar way filter cloths for disk type rotary suction filters are sent out from the factory all sewed up and can be put on in a few minutes time. In the case of drum type rotary suction filters, however, putting on new cloths is a very long and time-consuming operation, although with the classifications used it is impossible to indicate this distinction on the chart.

Temperature—Can Maintain Filter at Given Temperature. It is certainly incorrect to include "plate" filters and omit "leaf, pressure" type under this head. For example, the Kelly filter is a good example of the latter type and can be jacketed more readily and efficiently than a "plate" filter.

Acids or Alkalis. A considerable number of specially constructed "leaf, pressure" and "rotary suction" types of filters are actually in successful operation on various acid and alkali problems, and we can see no reason for omitting these types when "plate presses" are included.

Low Cost of Accessories. For many classes of service the only accessories required for a "leaf, pressure" filter is a feed pump, and this is also needed when a "plate" press is used. If this point is to be listed as an advantage of the "plate" press, it should also be credited to the "leaf, pressure" type.

Low Weight Per Sq.Ft. Filter Area. While I disagree with the chart on this point, the tabulation below shows that there is really not enough difference to make it of any great importance anyhow. While I do not have available at the moment any specific figures on "leaf, suction type," I am of the opinion that in most installations it would weigh less per sq.ft. of filter area than any of the following:

	Filter Area Sq.Ft.	Weight, Lb. Total	Per Sq.Ft.
36x36x60 in. chamber side feed press (plate type)	977	26,150	26.8
No. 12 Sweetland, 72 leaves (leaf, pressure type)	1,020	22,000	21.5
Type 8-6 American continuous filter (rotary suction type)	600	18,200	30.3

Operation—Low Repairs. Because of the wide variation in accounting systems used by different plants, any general statements on this question are usually easier to make than to prove with reliable facts and figures. Also, for certain classes of service the item of repairs is very much greater than with others. For example, when handling cane sugar mill muds in "plate" filters the cost of replacing broken plates (due to plugged inlet ports and resulting unbalanced pressures) frequently exceeds by far the total cost of repairs on similar sized "leaf" or "rotary" filter installations operating on other materials. For the above reasons it is difficult or impossible to lay down any general rule that will be applicable in all or even the majority of cases.

Operation—Use of Unskilled Labor. There is probably no place in the world where filter station labor is

more unskilled than in the sugar mills of Java, and yet a great many of them are entirely equipped with Kelly "leaf, pressure" filters. Incidentally, the same machines are extensively used in Mexico, South America and other countries where labor is exceedingly unskilled and since a "rotary suction" filter installed under proper conditions requires practically no labor at all, it is not clear to me why unskilled labor should prevent its satisfactory operation. In fact, rotary vacuum filters are actually being used in many countries where the labor is of the poorest.

Operation—High Pressure. Specially constructed "leaf" type Kelly filters are being successfully operated under pressures of 250 lb. per sq.in., which I believe to be as high as is ever required in ordinary filtration practice. It would consequently appear that "leaf" filters should also be included under this heading.

Operation—Automatic. Since the author has included this heading, it would be entirely proper to list "rotary suction" filters under it, since they are practically automatic in operation.

Operation—Suitable for Large Tonnages Varying Composition. A feed of "varying composition" is anything but an ideal condition for any filter to operate under, but I can cite many instances of both "leaf, pressure" and "rotary suction" filters giving at least as satisfactory results under such conditions as would "plate" presses.

In connection with the foregoing remarks, I wish to make it clear that I am not prejudiced either for or against any of the general types covered by the chart, since, with the exception of the "squeeze" and "centrifugal," the firm with which I am connected manufactures all of them.

JOHN T. HOYT,
Assistant General Manager,
United Filters Corporation.
Hazleton, Pa.

To the Editor of Chem. & Met.:

Sir:—I have your letter of March 28, inclosing copy of table by D. R. Sperry. In my estimation, it is almost impossible satisfactorily to classify filter operations by means of a chart such as that compiled by Mr. Sperry, this for the reason that practically all interpretations of the conditions set forth in the table will depend upon the particular industrial process in which the filtration is to be employed. The terms "Thin Cake" and "Thick Cake," "Efficient Washing," "Low Costs," "Easily Removed Cloths," "Quick Dumping," "Low, Medium and High Pressure," just to pick a few at random, are purely relative terms in the use of which it is almost impossible to generalize. However, this table will be of some value to your readers, within certain limitations, and I would suggest, in addition, the inclusion of the following data:

1. Cake—Whether a crystalline and porous or a dense and smeary cake can be handled.
2. Filtration media—Whether smeary, such as that produced by calcium phosphate, albumin, flocculent or colloidal material, or porous, as produced by fullers earth, diatomaceous earth, paper pulp, and so on.
3. Filter base—Tendency to become stiff or impermeable due to accumulation of mineral or other materials. Use of metallic filter cloth or wire screens.
4. Cleanliness of operations—Tendency to leak or "squirt."
5. Effect of pulsating pressure, varying pressure, etc.
6. Ease of replacing ruptured filter base, or continuance of filtration when filter base is ruptured.
7. Availability of different types of filter for different industries, such as sugar, varnish, vegetable oils, lubricating oils, etc.
8. Possibility of precoating in the case of flocculent materials.

Many other additions could, of course, be mentioned, but I presume a tabulation of this kind will always be far from complete. I believe, however, that if Mr. Sperry will include such of the above suggestions as he deems desirable, it would tend to somewhat enhance the value of his table.

JOHN WILLIAM SCHLEGEL,
Assistant Superintendent and Chemist,
National Sugar Refining Co. of New Jersey.
Long Island City, N. Y.

To the Editor of Chem. & Met.:

Sir:—I return herewith the table furnished by Mr. Sperry. You will note I have marked in the vertically hatched squares eleven additional possibilities or conditions that can be met by a properly designed and properly operated rotary vacuum filter, and when I say met, I mean efficiently met; for example, under temperature Mr. Sperry has nothing checked to the credit of the rotary suction filter. Handling hot liquid, or more specifically hot magmas, is just one of the things that a rotary vacuum filter can do in great shape; in fact, in our work filtering and washing, as well as reburning caustic sludges, we specify a minimum temperature of 85 deg. C. The handling of acids, of course, is entirely dependent on the materials of construction; on the contrary, it does not hold for alkalis, which can be handled in any strength.

I have crossed out medium depreciation, and I think rightly so, as a filter of my design has now been working constantly for 24 years and the repairs in all that time, with exception of renewal of filter cloth, have probably not exceeded $50. A letter just received from one of our clients speaks of a filter, which we furnished him, as having now been in night and day operation for 3 years without any repairs beyond the renewal of the filter cloth. Skilled labor is unnecessary for operation—a properly designed machine is not only simple but practically automatic.

If you desire any explanation in connection with the additional items I have checked I shall be very glad to furnish same.

W. D. MOUNT,
Glamorgan Pipe & Foundry Co.
Lynchburg, Va.

To the Editor of Chem. & Met.:

Sir:—In reply to your letter inclosing a table prepared by D. R. Sperry, there are several things on this table with which I do not thoroughly agree.

In some cases I have cross-hatched squares from right to left where I think they should go; in other squares I have blotted out crosses with similar cross-hatching. On the other parts of the table I am in accord with Mr. Sperry. The changes may be minor, but they did appear to me on examining the chart.

EDWIN C. ALFORD,
T. Shriver & Co.
Harrison, N. J.

Chem. & Met. hopes to continue this type of symposium on other unit processes and with other types of equipment. Only in this way is it possible to bring to the attention of chemical engineers and operating men the important factors that affect the choice of proper equipment. The editors wish to express their thanks to those who have participated in the symposium.

Extraction of Vanadium From Vanadiferous Sandstones

Preliminary Results of Attempts to Treat Sandstone Ores of Garfield County, Colorado

By H. A. Doerner

Assistant Chemist, Rare and Precious Metals Experiment Station, Bureau of Mines

THE vanadium deposits recently discovered in Garfield County, Colorado, are, according to reports, quite extensive and average about 3 per cent V_2O_5. The minerals in which the vanadium occurs seem to be mainly unidentified alteration products of roscoelite, with a smaller amount of carnotite. No typical roscoelite was found by careful microscopic tests on the sample investigated.

The object of this investigation is to compare the results obtained by different methods of treatment, in order to determine the most effective process for the extraction of vanadium from this type of ore. The methods investigated are as follows:

I. Simple roasting, followed by leaching with hot water and other reagents.

II. Roasting with sodium bisulphate, followed by leaching with hot water and other reagents.

III. Roasting with salt and soda, followed by leaching with hot water and other reagents.

IV. Autoclaving raw and roasted ore with sulphuric acid and salt, followed by leaching with hot water.

A 20-lb. sample of the ore was crushed and put through a disk pulverizer set to give a product most of which was —60 mesh. This was well mixed, sampled and the vanadium determined as 3.71 per cent V_2O_5. In most of the roasting tests 10-gram samples were placed in roasting dishes and heated in an electric muffle furnace; 100-gram samples were used in a number of roasting tests and in all the autoclave tests. In all cases the amounts of reagents used were kept within approximate limits of commercial feasibility. The tests include a large number of variations of all the factors involved.

Simple Roasting

Statements were received to the effect that commercial extraction of vanadium from these particular ores could be obtained by leaching the roasted ore with hot water or, preferably in some cases, 2½ per cent sodium sulphate solution. A series of tests in which the temperature and time of roast was varied over wide limits showed a maximum extraction of 35.3 per cent. This was obtained by roasting 1 hour at 950 deg. C. and leaching thoroughly with hot water. The use of sodium sulphate solution gave no better results. Leaching with 2½ per cent solution of sodium carbonate gave a maximum extraction of 62.8 per cent. This was obtained from a roast at 750 deg. for 1 hour.

Sodium Bisulphate Fusion

Fusion with an excess of niter cake will render practically all the vanadium soluble, but the expense is prohibitive. Table I gives results obtained by roasting with various amounts of sodium bisulphate followed by leaching (*a*) with hot water, (*b*) with 2½ per cent soda solution.

Table I—Extraction After Niter Cake Fusion

Roast	$NaHSO_4$, Per Cent	Temp., Deg. C.	Time, Hr.	Leach (*a*)	Leach (*b*)
1	10	800	1	....	45.9
2	20	550	1	2.4	38.8
3	20	650	1	0.0	50.7
4	50	650	1	0.0	76.8

Salt-Soda Roast

The salt soda roast is the process used successfully on roscoelite ore at Newmire, Colo.[1] The best results by this method were obtained as follows: The pulverized ore was mixed with 12 per cent salt (NaCl) and 2 per cent soda (Na_2CO_3); roasted 30 minutes at 700 deg. C., leached first with hot water and lastly with dilute sulphuric acid. Extractions of 75 to 77 per cent are readily obtained, which correspond to results obtained on roscoelite at Newmire.

Autoclave Treatment

The treatment of roscoelite in an autoclave with sulphuric or hydrochloric acid has been patented.[2] An autoclave used to test this method consists of a short length of 3-in. iron pipe, capped at each end and provided with a pressure gage. Sulphuric acid was diluted sufficiently to completely wet the ore, which was first mixed with the salt, if used, and then made into a thick mud with the acid in a 250-c.c. beaker. The beaker was placed in the autoclave with just enough water to float the beaker. The autoclave was then tightly closed, surrounded by a sheet of heavy asbestos paper and the bottom heated by a direct flame until a pressure of 100 lb. was reached and held. A portion of the excess hydrochloric acid vaporized, but the amount of sulphuric acid vapor was negligible. Considerable water vapor condensed in the beaker. After this treatment the charge was removed, disintegrated with hot water, filtered and washed. Table II gives typical results.

Table II—Extraction After Autoclaving

Test	H_2SO_4, Per Cent	NaCl, Per Cent	Time, Hr.	Extraction, Per Cent V_2O_5
1	17.5	0	1	68
2	17.5	0	3	71
3	26.3	0	2	78
4	35.0	0	2	84
5	26.3	2	2	85
6	26.3	5	2	85
7	17.5	0.1	3	81.5 } 93.3
8	17.5	0.1	2	11.8 }

Test 7 was treated without any water bath.
Test 8 was retreatment of residue from test 7.

Conclusions

Surprising results are obtained by a simple roast followed by a hot water leach, and much better extraction is obtained with sodium carbonate solution. The best results, however, fall short of commercial requirements. Any improvement obtained by the use of bisulphate is more than offset by the additional expense.

The standard method for roscoelite, a salt-soda roast, followed by a double leach with water and dilute sulphuric acid, gives a fair yield by a simple, inexpensive process. The autoclave treatment gives the highest yield, but the cost of reagents is considerably higher and the equipment required is much more expensive. Approximate cost estimates indicate a small advantage for the autoclave method. Samples of ore were kindly furnished by George F. Kunkle.

Communication from the Rare and Precious Metals Experiment Station, Bureau of Mines, in co-operation with the Mackay School of Mines, University of Nevada. Published with the permission of the Director, Bureau of Mines.

[1] W. F. Bleeker, U. S. Pat. 1,015,469.

[2] G. A. Koenig, U. S. Pat. 986,150.

Equipment News

From Maker and User

Two-Cycle, Double-Acting Diesel Engine

New Deve'opment in Prime Movers]] Holds Promise of Radical Improvements in Power Generation

On Aug. 28 last the Worthington Pump & Machinery Co. demonstrated for the first time, at its Buffalo plant, a new design of two-cycle, double acting Diesel engine that constitutes a distinct departure in the power generation field. This engine permits the development of approximately twice the horsepower per cylinder when compared with the largest power Diesel units heretofore available. It is said to have a fuel economy equal to the best types of oil engine now used, while the dimensions, weight and construction costs per horsepower approximate those of reciprocating steam machinery. These facts are claimed to make this engine a real competitor of steam power machinery in a much wider field than that formerly occupied by the Diesel engine. Any question of oil shortage as affecting such competition is answered by the fact that the new engine runs as well on coal distillate as it does on petroleum.

This new design, worked out by the technical staff of the Worthington company, is largely due to the collaboration of O. E. Jorgenson of that staff and Prof. C. E. Lucke, of Columbia University, an internationally known authority on internal combustion engines. It was primarily designed to fill an urgent need in the marine propulsion field, where the size of the newly developed motor-ship was limited by the possible size of the oil engines. While this will undoubtedly provide an important outlet for the new engine, it is now said that industrial plants and even central station generating plants will find the unit of importance.

A paper giving full details of the design, performance and commercial possibilities of this engine will be read at the annual meeting of the American Society of Mechanical Engineers in New York next December.

Correction

In the Equipment News columns of *Chem. & Met.* for Aug. 4, 1924, appeared an account of the "Pyro" Radiation Pyrometer. The manufacturer of this instrument was stated, through an error, to be the Foster Instrument Co. We have since learned that the device is made and marketed by the Bowen Instrument Co., Leeds, England, and we trust that those who are interested in it will so note.

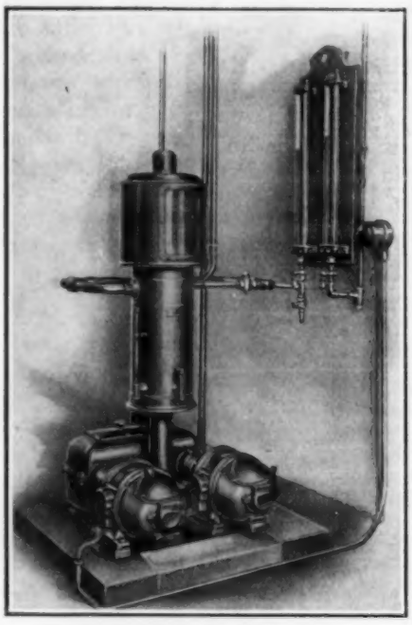


Fig. 1—Reineke Regulator

Automatic Regulation of Gas Pressure

The accurate and automatic regulation of pressure in gas mains or flues is highly important in many industrial plants. Numerous attempts to solve this problem have been made, but difficulty has been experienced in securing accuracy and quick response to small variations of pressure. Attention has been drawn of late, however, to the success achieved by the use of the Reineke regulator (Fig. 1), the result being accomplished by an ingenious application of a differential gear to the throttle or damper operating shaft. To this differential gear are connected two motors, constantly running, which keep the regulator mechanism in motion. The smallest change in gas pressure is instantly transmitted to the damper mechanism through the differential gear, which is already in motion, with an attained momentum. There is no starting lag, and no sudden shock results from a jerking of the mechanism to meet the change in pressure. The adjustment is smoothly and instantaneously accomplished by a change in speed of one or other of the motors, without the necessity of reversing any moving part.

Fig. 2 shows the differential-gear mechanism. The worms marked 1 and 2 are coupled to two electric motors, running continuously at equal speeds, but rotating in opposite directions and driving the combination wheels 3 and 4, mounted loose on shaft 5. The bevel teeth of these wheels are geared with two bevel idler pinions, 7 and 8, which are loose on the bolt spindle 6, which passes through the shaft 5 at right angles and acts as a carrier of the movement. The worm 9 is fast on the shaft, and is geared with the worm 10, which is keyed on the vertical shaft that projects through the casing of the differential gear.

When the pressure in the main is normal, the float (see Fig. 3), which works the electrical levers, remains at rest; and both motors, as well as combination wheels 3 and 4, run at the same speed. Therefore the idler pinions, each of which is loose on its spindle, remain in the same radial position and no movement is transmitted to the damper in the main. When the pressure rises, however, or falls below the desired normal, the float moves, and, according to the fluctuation, actuates the contact gear controlling the motors, thus reducing the speed of one or other of the motors. As the apparatus works in direct gear with the motors, this change of speed also occurs in either of the combination wheels 3 and 4, and causes the pair of

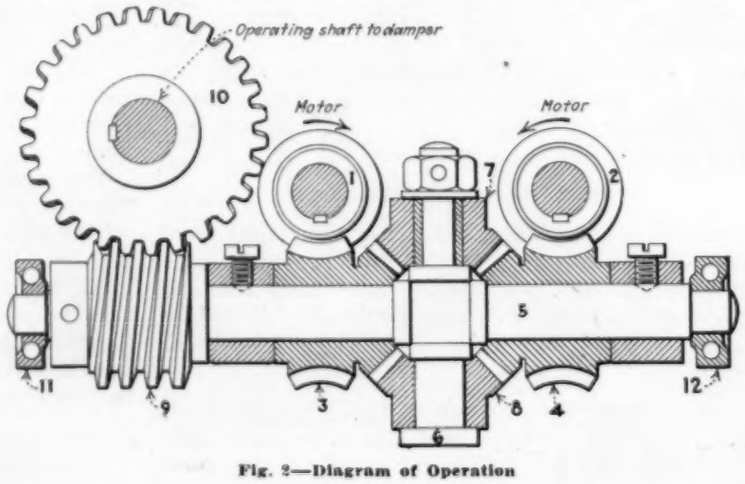


Fig. 2—Diagram of Operation

idler pinions to roll and alter their radial position in the requisite direction around the central axis of shaft 5, which transmits the movement by worm gear to the damper in the main, thus instantaneously regulating the amount of gas that is allowed to flow through it.

Figs. 4 and 5 give comparative charts of pressures in a 6-ft. diameter blast-furnace gas main, in which the supply pressure varied between zero and 18 in. water; the regulation accomplished by the Reineke regulator is also shown. It will be noted that where, in Fig. 5, the pressure shows a drop below the line of pressure at which the regulator was set to work, this is solely due to the fact that the pressure in the supply main was already below the desired regulated pressure. Moreover, it will be noted that the regulated pressure can be changed without shutting off the gas or interrupting operations in any way, by lowering or raising the floats (see Fig. 3) by means of the small hand screw within the upper casing of the float-gear mechanism.

The Reineke regulator has found extensive application in Europe, where more than 200 installations are in operation. It is being manufactured and marketed by the Western Precipitation Co., 1016 Ninth St., Los Angeles, Calif.

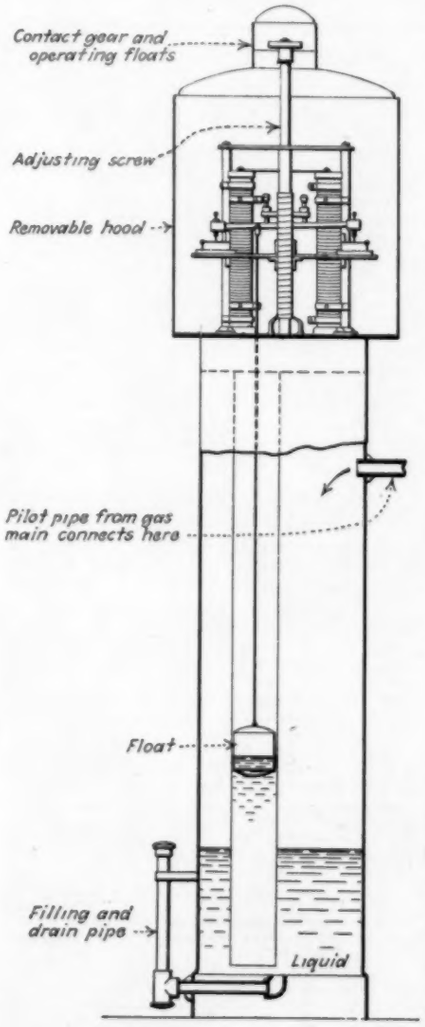


Fig. 3—Phantom View of Regulator

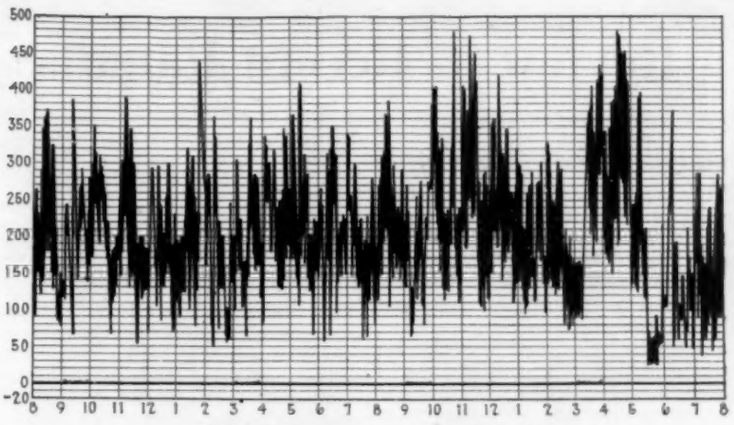


Fig. 4—Pressure Chart, Unregulated

Fig. 5—Pressure Chart, Regulated

Chain Screens

A device used in the glass industry for cutting down the heat and glare at open furnace doors has had some application to boilers and seems to hold out promise of usefulness in other fields. This is the Chain Shadow Pan, made by the E. J. Codd Co., Baltimore, Md.

The device consists of a large number of freely hanging individual strands of a specially constructed steel chain so suspended from a bar as to form a practically continuous curtain. This curtain is hung before the furnace opening and hinders the emission of heat and light therefrom. The loose hanging strands of light chain are easily parted and tools, etc., put into or taken out of the furnace, the chains falling together again after the passage.

For boiler furnaces a special semi-automatic curtain is supplied. In this equipment the curtain is attached to a roller, so that it is rolled up out of the way when the door is closed. When the door is opened, the curtain is automatically let down to cover the furnace doorway.

It is claimed for this device that it saves much heat otherwise wasted and that it makes the performance of work about a furnace door much easier because of the protection afforded the workmen, in this way affecting both the fuel and labor costs.

Electric Pipe Threader

A portable, electric-driven pipe-threading tool has recently been placed on the market by the Oster Manufacturing Co., Cleveland, Ohio. This machine is designed to cut and thread pipe in sizes from ⅛ in. to 2 in. The pipe is held by a built-in vise and a chuck, both being self-centering and self-locking. The die-stock turns with the motor, which is a ½-hp. Westinghouse with 10-ft. cord and screw plug for attaching to light socket. The gears are completely incased and run in oil. The machine can also be used for making up the fittings. It can be easily mounted on a hand truck and used in any place desired.

Manufacturers' Latest Publications

Link-Belt Co., 910 So. Michigan Ave., Chicago, Ill.—Book 650. A new catalog of portable loaders for use in handling such materials as coal, ashes, sand, gravel, cement, fertilizer, limestone, crushed rock, phosphate rock, clay and bagged materials.

Weston Electrical Instrument Co., Newark, N. J.—Bulletin 501-E. A new and complete catalog of portable instruments for direct current work, including a new rotary switch, portable precision, multiple range shunt and a new type supersensitive, pivoted movable coil galvanometer, also d.c. relays.

N. B. Payne & Co., 25 Church St., New York City—A folder describing and giving prices of all kinds of cranes, conveying equipment and miscellaneous industrial equipment now stocked by this concern.

De Laval Steam Turbine Co., Trenton, N. J.—Bulletin No. E-1070. A new catalog describing De Laval sewage pumps.

Leeds & Northrup Co., Philadelphia, Pa.—Bulletin No. 872. The second of a series of bulletins on the use of electrical measuring instruments in the power plant, this number covering instruments for measuring flue gas temperatures such as potentiometer pyrometers.

Merck & Co., 45 Park Place, New York, N. Y.—A new general catalog of this concern's line of laboratory chemicals.

Western Gas Construction Co., Fort Wayne, Ind.—A binder containing new bulletins covering such equipment as retort house governors, automatic chargers, oil sprays, rotary scrubbers, wash boxes, water gas plants, valves and automatic controls.

W. A. Jones Foundry & Machine Co., Chicago, Ill.—Catalog 29. A new general catalog of the various types of gears manufactured by this concern.

Crescent Refractories Co., Curwensville, Pa.—Bulletin, Series 1, No. 5. A bulletin giving in tabular form the number of brick required for different sizes and types of boiler setting.

The Thermo Electric Instrument Co., 14 Johnson St., Newark, N. J.—A bulletin describing the "Thelco" constant temperature electric oven.

Raymond Bros. Impact Pulverizer Co., Chicago, Ill.—Bulletin 1. A catalog describing the new "Imp" pulverizer, a complete unit for pulverizing and separating various materials.

Review of Recent Patents

Antimony Oxide Pigment

Air blown through molten metallic antimony (made for example according to U. S. Pat. 1,475,294) produces antimony oxide, Sb_2O_3. This in contact with air above the bath would be further oxidized to Sb_2O_4 or Sb_2O_5, both of which are undesirable in pigments. A furnace construction that prevents this secondary oxidation and still makes it possible to add antimony to the bath is described by Antonin Germot of Asnières, France. A bell-shaped tube the lower edge of which dips under the surface of the molten antimony serves to conduct the oxide fume to the settling chambers. The blast-nozzle for air is located below the surface of the bath within the zone surrounded by the bell. (1,504,685, Aug. 12, 1924.)

Nitrostarch Explosive

Harry W. Klinger, of Kenvil, N. J., avoids the difficulties involved in attempting to separate nitrostarch from the spent acids used in its preparation, by nitrating the starch in glycerine solution.

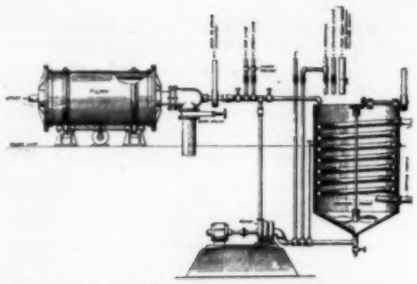
Starch, 15 parts, is added to 85 parts of dynamite glycerine. The mixture is heated to 220 deg. F. for 6 hours in the presence of 0.5 part HCl. When the starch is dissolved, about 20 parts of the solution are introduced into a nitrator and nitrated with about 100 parts of mixed acids of the approximate composition: nitric acid, 49 per cent; sulphuric acid, 51 per cent.

On completion of the nitration to the desired degree, the nitrated solution is withdrawn from the nitrator and the spent acids are allowed to settle out. After settlement of the spent acids, they are drawn off and the nitrated solution washed with water at a temperature of about 115 deg. F. to remove the bulk of the dissolved acids. The nitrated solution is then purified and stabilized by washing with a 3 per cent solution of sodium carbonate in water at a temperature of about 115 deg. F. (1,503,956, assigned to Hercules Powder Co., Wilmington, Del., Aug. 5, 1924.)

Decolorizing Mineral Oils

The usual practice where petroleum products such as lubricating oils, cylinder stocks, etc., are filtered is to charge from 20 to 50 tons of coarse fullers earth into vertical filters or percolators. Common practice is to feed the oil into the top of the percolators and filter by gravity at atmospheric pressure, although some refineries filter under a low pressure of 5 to 15 lb. The oil remaining in the earth is then driven out to some extent by air pressure, is then more thoroughly taken out by a naphtha wash and the naphtha is then steamed out.

There are serious objections to the present method of filtration, among which are the slow rate of filtration and the great length of time required for operations other than those producing filtered oil, due to the great depth of fullers earth, usually varying from 15 to 20 ft. in the vertical type filter; the tendency to channel allowing unfiltered stock to get into the filtrate; the low yield of filtrate per pound of clay due to the tendency of the unfiltered stock, to pass down through the filter between the coarse grains instead of through the grains of fullers earth; fractional filtration, which means that for a certain quantity of unfiltered stock charged to the filter only a limited amount of a given grade of filtrate can be taken off, the stream of oil from the filter becoming more and more like the original stock charged to the filter as filtration proceeds, the spent earth being saturated at the end of the filtration period with oil almost as impure as the original stock; and the impossibility of using the fine mesh earth which occurs at the mills when grinding the coarse sizes, which causes



Decolorizing and Filtering Mineral Oils

a loss of serious importance to the mill owners, as it amounts to about 15 per cent of the total amount mined and sold for treating mineral oils.

Fred W. Manning, of Chicago, Ill., has found that it is possible to treat the oil with fullers earth of 60 to 100 mesh (varying with the viscosity of the stock) in an agitator tank, filtering immediately in a rotary pressure filter that he has developed for this purpose. Owing to the fineness of the earth, decolorization takes place in the mixing tank and as it is not desirable to permit long contact between earth and oil, the mixture is filtered immediately. (1,504,772, assigned to Manning Refining Co., Aug. 12, 1924.)

U. S. Patents Issued September 2, 1924

Method of and Apparatus for Dehydrating Fluid Bodies. George H. Benjamin, New York, N. Y.—1,506,732.

Apparatus for Drying Pulp Products. Daniel M. Sutherland, Jr., Trenton, N. J.—1,506,789.

Gas Producer. Albert L. Galusha, Caldwell, N. J.—1,506,826.

Producing Oxalates From Formates. Walter Wallace, La Salle, N. Y., assignor to Oldbury Electro-Chemical Co., Niagara Falls, N. Y.—1,506,872.

Apparatus for Producing and Separating Certain Substances. Victor M. Weaver, Harrisburg, Pa., assignor to Weaver Co.—1,506,873.

Process for the Conversion and Transformation of Liquids, Fluids and Oils. Joseph H. Adams, Flatbush, N. Y., assignor to Texas Co., Houston, Tex.—1,506,877-8.

Method for the Recovery of Salt. A. Schilling, San Francisco, Calif.—1,506,946.

Purification of Sulphur Dioxide. Frank W. Andrews, Wapakoneta, O.—1,506,963.

Tank-Discharge-Controlling Device. Rudolph Conrader, Erie, Pa.—1,506,973.

Process of Preparing Material for and Producing Therefrom Nitrified Material. James H. Reid, Readsboro, Vt., assignor to International Nitrogen Co., Cleveland, O.—1,506,999.

Apparatus for the Vulcanization of Articles of Rubber, Rubber Substitutes and the Like. Harold Hawthorn and Harry A. Huntley, London, England.—1,507,059.

Apparatus for Generating Gas. Seth Hayes, Cleveland, O.—1,507,060.

Pump. Fred D. Hoffman, Kansas City, Mo.—1,507,062.

Method of Producing Alkali-Metal Xanthates. Ludwig Rosenstein, San Francisco, Calif.—1,507,089.

Process of Oxidizing Hydrogen Sulphide. Hanns Carstens, Leverkusen, near Cologne, Alfred Engelhardt, Wiesdorf, near Cologne, and Wolf J. Muller, Leverkusen, near Cologne, Germany, assignors to Farbenfabriken vorm. Friedr. Bayer & Co., Leverkusen, near Cologne-on-the-Rhine, Germany.—1,507,105.

Process and Apparatus for the Continuous Distillation of Alcohol. James F. Cyphers, Baltimore, Md.—1,507,108.

Process of Heating and Distilling Liquids and Apparatus Therefor. Glenn A. Keep, Elizabeth, N. J., and Clayton M. Hoff, Cleveland, O., assignors to Grasselli Chemical Co., Cleveland, O.—1,507,120.

Process and Apparatus for Producing Free Nicotine From Its Salts. Henry K. McConnell, Richmond, Va., assignor to Tobacco By-Products & Chemical Corp., Louisville, Ky.—1,507,135.

Method for Treating Materials Containing Metal Compositions. Edward S. Berglund, Djursholm, Sweden.—1,507,152.

Process and Apparatus for Sealing Under Vacuum. Richard M. Garrett, New York, N. Y., assignor to Nestle's Food Co., New York, N. Y.—1,507,166.

Acid Distributor. John Patten, Baltimore, Md., assignor to Davison Chemical Co., Baltimore, Md.—1,507,201.

Process of Making Cellulose Ethers. Paul C. Seel, Rochester, N. Y., assignor to Eastman Kodak Co., Rochester, N. Y.—1,507,210.

Process for Purification of Pig Iron in Blast Furnaces. Charles J. Somers, Jersey City, N. J., Gordon C. Tibbits, Somerset, Md., and Edward F. Quinn, Brooklyn, N. Y.—1,507,214.

Method of Liquefying Gas. William M. Jewell, Chicago, Ill., assignor to Chlorine Products Co., Chicago, Ill.—1,507,289.

Built-Up Member for Paper-Pulp Engines. Archer Le R. Bolton, North Andover, Mass.—1,507,305.

Method of Preparing Short-Fiber Cellulosic Material for Chemical Treatment. Alfred L. Broadbent, Wilmington, Del., assignor to E. I. du Pont de Nemours & Co., Wilmington, Del.—1,507,330.

Method of Manufacturing Composition Wall Board. Joseph A. Buttress and George A. Buttress, Los Angeles, Calif., assignors to Rex Goodcell, Los Angeles, Calif.—1,507,332.

Purification of Ether and of Other Volatile Substances. James H. Cotton, Toronto, Ont., Canada, assignor to E. I. du Pont de Nemours & Co., Wilmington, Del.—1,507,337.

These patents have been selected from the latest available issue of the "Official Gazette" of the United States Patent Office because they appear to have pertinent interest for "Chem. & Met." readers. They will be studied later by "Chem. & Met.'s" staff, and those which, in our judgment, are most worthy, will be published in abstract.

Complete specifications of any United States patent may be obtained by remitting 10c. to the Commissioner of Patents, Washington, D. C.

Readers' Views and Comments

An Open Forum

The editors invite discussion of articles and editorials or other topics of interest

Technical Association for the Soap Industry

EDITOR'S NOTE: On March 24, 1924, an editorial was published in *Chem. & Met.* entitled "An Opportunity for Soap Technologists." At that time the suggestion was put forward that the lack of a technical association in the industry appeared surprising considering the benefits gained by other similarly constituted industries through cooperation of this sort. Herewith are a few of the expressions of opinion we have received with regard to our comments:

To the Editor of Chem. & Met.:

Sir—I am sympathetic toward the idea of the formation of a technical association in the soap industry, which is being brought forward by *Chem. & Met.* It cannot be denied that a real live association of this kind could be a benefit to the technical men in the industry, to the individual companies and to the industry as a whole. In this day of associations and societies for every conceivable purpose, however, it is necessary for an individual of any breadth of interest to choose and limit the extent to which he supports and encourages such activities or he would have time for but little else. When he is asked to contemplate the formation of another society he is likely to be only lukewarm in his enthusiasm. In one which would touch his daily interest so closely as an association of the technical men of his industry he is likely to show a somewhat livelier interest, conditioned on his conception of how vigorous and successful it will be. Its success will depend on the interest and enthusiasm of the several hundred technical men, on the efforts of able leaders and on the interested support rather than the mere tolerance of the leading soap manufacturers. If we can have a reasonable measure of these essentials I am heartily in favor of the formation of such an association. *Chem. & Met.* is performing a good service to the industry by its effort to find out. Let the good work go on.

HARRY M. WYLDE,
Research Dept., Lever Bros. Co.
Cambridge, Mass.

To the Editor of Chem. & Met.:

Sir—The success of an organization such as you suggest for the soap industry would depend on the willingness of the directing heads of the larger organizations to extend information to those small concerns that have been unwilling or unable to purchase technical skill. If a large industry has spent its money acquiring wide information of a technical nature, that information is just as much the property of that company as its plant investment and personnel, and it is questionable whether it is good business freely to share such information with competitors.

We do feel, however, that between competitors of approximately the same magnitude of operation and with mutual interests as to similarity of articles manufactured, a reasonable exchange of information for the purpose of securing increased mutual efficiency is quite valuable. I think the trouble is that there is really no mutual exchange of information between a large manufacturer and a small manufacturer, as the small manufacturer gets the benefit of a large manufacturer's experience and technical staff, without giving very much in return for it.

We should be very pleased indeed to hear what expressions you have had from other members of our industry in regard to this matter.

N. N. DALTON,
Vice-President,
Peet Bros. Co.
Kansas City, Kan.

To the Editor of Chem. & Met.:

Sir—With regard to a technical association among the technologists of the soap industry, I heartily indorse the idea. If I can be of assistance, I will be glad to have you call on me.

Judging from experience in meeting and dealing with technical men associated with the soap industry, it is my opinion there is a genuine need of exchanging ideas in a broad way. Contact gained through an organization such as you propose would benefit the industry as a whole.

I would be pleased to hear from you further regarding progress in this matter.

J. W. BODMAN,
William Garrigue & Co., Inc.
Chicago, Ill.

To the Editor of Chem. & Met.:

Sir—I am very much in favor of forming a soap chemists' society.

The chemists in soap plants have a great variety of work. This includes oil chemists, soap chemists, perfume chemists, etc. Nowadays, most of these lines are specialized in large plants. I believe, however, that these men would all be interested in any line of work connected with the soap business.

V. K. CASSADY,
Chief Chemist,
The Palmolive Co.
Milwaukee, Wis.

To the Editor of Chem. & Met.:

Sir—I should be very glad to join such a technical association as you suggest in your editorial of March 24, providing it is established, and believe there might come some industrial and technical benefits from such an association.

W. W. ROBERTSON.
Orford Soap Co.
Manchester, Conn.

To the Editor of Chem. & Met.:

Sir—There is plenty of opportunity for soap technologists, but I think it is better for the technologists of the individual companies to direct their efforts to the improvement of the methods of their own companies, rather than to establish a clearing house through which those that do not engage chemists and engineers may gain the advantage without expense to themselves that others acquire through the employment of competent chemists and engineers. It would be of greater service to the industry and to chemists and engineers if you pointed out the advisability of all manufacturers availing themselves of competent technologists; and certainly until all manufacturers are employing such technologists there is no good reason for the formation of a clearing house of information you have spoken of.

It was to encourage science and invention that the Constitution of the United States included in the duties of Congress the right to give to inventors and writers certain exclusive rights to their inventions and writings. For good and obvious reasons, many of the most valuable practices that soap manufacturers have are of such a nature that they cannot be protected adequately by patent.

If the technologists of the different soap manufacturers were to get together and talk freely of their findings and experiences, those that made the greatest efforts and that did the most to advance their industry would in this way enjoy no exclusive benefit from their efforts, which would then go without cost or trouble to the concerns making the least effort or no effort to advance their industry. Such a group of technologists, therefore, instead of advancing the industry, would do much to destroy competitive effort and retard progress in the industry.

On the other hand, it may be desirable and decidedly helpful for analytical chemists in any trade that involves the sale and purchase of materials or specifications to get together and arrive at mutually satisfactory specifications and methods of analyses. Discussions that would come up before such gatherings would involve only the character of articles known to all and would not involve methods of manufacture which; for various reasons, it is often desirable to keep secret.

The soap field is probably no more addicted to unfair practices than most other fields, but unfortunately there are cases of such that it would be desirable to rout out by concerted action. A proper understanding among advertisers, or, better, among manufacturers themselves, might go far to correct these abuses. Among these I might mention a few of the most glaring:

The practice of selling soaps to the public through claiming advantages for them in use that are supposed to belong to certain oils claimed to be used in the manufacture of such soaps, even though these oils do not exist as oils in the soaps, and even though the soaps in question may be made of other oils, and even though the soaps do not possess the advantages claimed for them.

The practice by some of referring to the use of rosin in soaps as an adulterant and leading people to believe that such soaps turn clothes yellow; whereas the truth is that rosin is one of the most valuable of soap ingredients, since it increases the washing value under average conditions and since soaps containing it do not turn clothes yellow any more than white soaps do.

The practice of referring to the use of a moderate amount of sal soda or silicate of soda in some soaps as adulteration, when the use of these materials in moderation enhances the washing qualities of these soaps, under the average conditions of use.

It is a fine thing that university workers are free to publish their findings, and their work thus helps all the industries, but the industries themselves cannot undertake to supply free information either to those who will not employ chemists or engineers, or to patent specialists who may take out patents on their processes through information thus gained.

MARTIN H. ITTNER,
Colgate Co.

Jersey City, N. J.

Chemical Engineer in Rubber Industry

To the Editor of Chem. & Met.:

Sir—The editorial on "Underrating the Chemical Engineer in the Rubber Industry" in your June 2 issue, p. 854, is very interesting, and it is with some surprise that I read your statement that in certain quarters of the rubber industry the field for chemical engineers is not appreciated.

It has been the policy of the Hood Rubber Co. practically from the start to employ in its technical department chemical engineers as well as chemists, and the wisdom of this policy has been most clearly demonstrated here. In addition to the fields you mention in the editorial there is also the question of vulcanizing equipment and procedures; also devulcanizing and other allied problems where the chemical engineer is, perhaps, better equipped than the chemist.

It not infrequently happens that the chemist is called upon to assume an executive position in the factory organization totally outside the laboratory, and it has been our experience that some knowledge of engineering is in such instances likely to be a great help. In general we agree with the editorial absolutely.

N. E. TOWSLEY.
Technical Superintendent,
Hood Rubber Co.

Watertown, Mass.

Books Recently Received

Crystal Structure

THE STRUCTURE OF CRYSTALS. By *Ralph W. G. Wyckoff*. 462 pages, 213 illustrations. Chemical Catalog Co., New York. Price, $6.

It is the aim of Part I of this book to give the reaction of a single point of view toward the material of crystal analysis as it now exists. In Part II all existing diffraction data are treated from the point of view outlined in Part I. Applications are considered in the final chapter.

Analytical Methods

METALLURGICAL ANALYSIS. By *Nathaniel W. Lord*, late professor of metallurgy and mineralogy, Ohio State University, and *Dana Demorest*, professor of metallurgy, Ohio State University. Fifth edition, 472 pages. McGraw-Hill Book Co., New York. Price, $4.

In this revision the old material has been largely rewritten. The chapters on coal calorimetry, gas calorimetry, fire assaying and electrometric titration are entirely new. The chapters on water analysis, analysis of alloy steels and gas analysis have been almost entirely rewritten. The scope of the methods has been enlarged to include in so far as possible all of the chemical analyses which the metallurgical chemist is likely to require except those of paint.

QUANTITATIVE ANALYSIS. By *Edward G. Mahin*, professor of analytical chemistry, Purdue University. Third edition, 595 pages. McGraw-Hill Book Co., New York. Price, $4.

In this edition the treatment of a number of special measurements in analytical chemistry has been placed in a special section of the book. This covers density and specific gravity, heat of combustion, index of refraction and optical rotation. New work added includes a treatment of the analysis of marls and of similar carbonate-silicate rocks and of hydraulic cements; and of the bismuthate, persulphate and permanganate methods for the determination of chromium in steel.

FOOD ANALYSIS. By *A. G. Woodman*, associate professor of food analysis, Massachusetts Institute of Technology. Second edition. 529 pages, 108 illustrations. McGraw-Hill Book Co., New York. Price, $3.50.

In this revised edition the plan and scope of the book have remained unchanged. The methods have been carefully reviewed and changed where necessary to conform to present practice. Chapters on cocoa and chocolate have been rearranged and rewritten.

General Chemistry Texts

SMITH'S COLLEGE CHEMISTRY. Revised and rewritten by *James Kendall*, professor of chemistry, Columbia University. 747 pages, 147 illustrations. The Century Co., New York and London. Price, $3.50.

Practically the entire book has been rewritten, but at the same time every effort has been made to leave the volume a characteristic Smith text. In the early chapters particular attention has been paid to a restatement of the fundamental conceptions of molecular and atomic weights. The chapters on solution and ionization have been rearranged and expanded in accordance with the modern viewpoint. In the latter half of the volume the chemistry of the more familiar carbon compounds has been treated in somewhat greater detail than is customary in text books of general chemistry, in order that students who are going no further into the subject may not miss the opportunity of correlating their knowledge with the facts of every-day life. Many sections have been introduced dealing with newly developed and important industrial processes and with the application of chemistry to modern warfare.

COLLEGE CHEMISTRY COMPANION, for use in conjunction with the revised edition of "Smith's College Chemistry" and "A Laboratory Outline of College Chemistry." By *James Kendall*, professor of chemistry, Columbia University. 230 pages, illustrated. The Century Co., New York and London. Price, $1.50.

Instead of following the common custom of firing a volley of problems point-blank at the student at the end of each chapter or of making assignments in auxiliary books devoted entirely to chemical calculation, Professor Kendall has developed this little book for the purpose of correlating the theoretical and experimental phases of the course and showing how they can be applied in the solution of practical numerical problems. In this way it is possible to develop certain portions of the subject in a way which would not be practicable in the body of the text itself and also to indicate a wide range of references to important articles in technical literature.

INTRODUCTION TO GENERAL CHEMISTRY. By *William Foster*, professor of chemistry, Princeton University. 643 pages, illustrated. Princeton University Press, Princeton, N. J. Price, $3.50.

This text book is the result of more than 15 years of experience in teaching general chemistry to large classes of college students. In 1922 a limited edition was printed in order to test the book thoroughly with students at Princeton under the supervision of a large corps of professors and instructors. The text book has been used by about 800 beginners and 125 students who had offered chemistry for admission. After this real test in the lecture room and class room the book was carefully revised and changed to its present form. It is therefore presented with the hope and belief that it has passed the experimental stage and that it is "teachable."

A LABORATORY MANUAL IN GENERAL CHEMISTRY. By *William Foster*, professor of chemistry, Princeton University. 205 pages, illustrated. Princeton University Press, Princeton, N. J. Price, $2.

This manual is designed to accompany the author's "Introduction to General Chemistry."

Open-Hearth Design

THE PLANNING, ERECTION AND OPERATION OF MODERN OPEN-HEARTH STEEL WORKS. By *Hubert Hermann*. 307 pages, 273 illustrations. Ernest Benn, Ltd., London. Price, 42 shillings.

This is the authorized English edition of a recent German book, which treats in a very practical way the location of steel works in relation to other plants, the relative location in the individual departments, as well as details of furnaces, gas producers and auxiliary machinery used in an open-hearth steel plant.

News of the Industry

Summary of the Week

Ithaca meeting of the American Chemical Society well attended. Visiting foreign chemists add to attractive program.

Engineering Societies building in New York transformed to ordnance center on Defence Day.

Boll weevil infestation in the cotton belt is reported to be less than 25 per cent of normal.

Material gains reported in production of paints and varnishes for first 6 months of 1924 as compared with last half of 1923.

Contract prices for muriate of potash and other potash salts are named by representatives of foreign producers.

Geneva conference of League of Nations indicates that chemical warfare is factor forcing measures to safeguard against war.

Trade association activities not to be passed on by Department of Justice till after election, according to present prospects.

Government renews fight to recover patents held by Chemical Foundation, holding that federal District Judge Hugh M. Morris erred in his decision dismissing earlier government suit.

Treasury Department announces that, after 30 days, immediate containers of imported dyes must contain accurate description of contents.

Government Renews Suit to Get Foundation Patents

The fight of the government has been renewed to obtain the patents awarded to the Chemical Foundation during the war. Last week Attorney-General Harlan F. Stone filed in the federal Circuit Court of Appeals for the Third Circuit, in Philadelphia, a brief of 499 pages in which the government contended that federal District Judge Hugh M. Morris of Wilmington, Del., had erred in many important points in January in his opinion dismissing the government's suit against the Chemical Foundation, Inc.

In his opinion Judge Morris held that the government had failed to establish its conspiracy charge against manufacturers of the American Dyes Institute; that the sales of patents, trademarks, copyrights, etc., seized by the Alien Property Custodian from German ownership and sold to the Foundation, was proper and in the public interest, even though at private sale and even though the 4,500 patents brought only $250,000; that Francis P. Garvan, Custodian and later president of the Foundation, and other public officials connected also with the Foundation had not violated the federal criminal code; that under the trading with the enemy act the Custodian, under Presidential orders, had unlimited power to do what he wished with the property; that President Wilson properly delegated power to Under Secretary Frank L. Polk to direct the transaction in question, and that the sales, as made, did not constitute confiscation.

The government brief contends that Judge Morris erred in his judgment and insists that the sales were illegal and should be set aside and "that this cause should be remanded to the District Court with instructions to grant to the government the relief prayed for in the bill of complaint."

The properties in question were transferred to the Foundation between April 10, 1919, and Nov. 4, 1921, negotiations being undertaken when A. Mitchell Palmer was Custodian, and being completed when Mr. Garvan had become his successor in that office.

The government's suit, if successful, would require the return of these properties to the government, for disposition by Congress, together with an accounting by the Foundation of income and revenues derived during its possession and licensing of these properties.

Decline in Imports of Dyes in August

The imports of coal-tar dyes for August, 1924, through the port of New York totaled 64,546 lb., with an invoice value of $71,290. In addition imports through other ports include 14,750 lb. with an invoice value of $14,521, for Providence; 1,000 lb. with an invoice value of $1,142, for Boston; and 100 lb., valued at $61, for Philadelphia.

The conspicuous drop in the August dye imports may be largely accounted for by the subnormal activity of the domestic textile industry and anticipation of the reduction in the ad valorem rate of duty on dyes from 60 per cent to 45 per cent on Sept. 22, 1924. In this connection the stocks of dyes in bonded warehouse are of interest. The following figures taken from monthly summary of foreign commerce of the United States, indicate warehouse stocks as of July 1, 1924. The "general imports" (embracing imported articles entered for immediate consumption on arrival and articles entered for warehouse) of coal-tar dyes (for the first 6 months of 1924) amounted to 1,748,308 lb., while the "imports for consumption" (embracing imports entered for immediate consumption and withdrawals from warehouse for consumption) amounted to 1,583,677 lb. The excess of the general imports over the imports for consumption is accordingly 164,631 lb. Deducting 36,449 lb., representing the re-exports of foreign coal-tar dyes for the first 6 months of 1924, leaves a total of 128,182 lb. in the warehouse as of July 1, 1924, which may be withdrawn for consumption or for exportation. It may be expected that these dye stocks have been materially increased during the month of July. The total stocks of coal-tar intermediates remaining in bonded customs warehouses on June 30, 1924, amounted to 1,196,757 lb.

Trade Association Activities Not a Live Issue at Present

Apparently the Department of Justice has placed the entire controversy with regard to trade association statistics in cold storage until after the election. While it is regarded as practically certain that the department will take no exception to the association that collects statistics of production and stocks and communicates only aggregates to its members, it is thought certain that no statement with regard to trade associations will be forthcoming at this time.

The strong stand taken by the American Federation of Labor opposing undue limitation of trade association activities is expected to discourage any demagogic attacks on this type of business activity.

Chemists Enjoy Ithaca Meeting

Distinguished Foreign Chemists Among Those Entertained by Cornell University at the Fall Meeting of the American Chemical Society

IT CAN truly be said that Cornell University welcomed the American Chemical Society with open arms. During the week of Sept. 8, the hundreds of visiting members and guests were housed in its dormitories, fed in its dining halls, inspired by addresses delivered in its magnificent auditoriums and entertained by its students and alumni. For the time being they were part of the university. The thoughtfulness of the local committee was everywhere in evidence; all details of comfort and convenience were carefully planned and admirably well executed.

On Monday afternoon, Sept. 8, 113 members of the Council met in Prudence Risley Hall, with President Baekeland presiding. After a few preliminary announcements, Secretary Parsons presented the recommendation of the executive committee that George B. Burnham be dropped from membership. Mr. Burnham had been asked to refrain from using the society's name in connection with promotional literature and had promised to comply with the request but had failed to do so. He was then asked to resign but refused. In presenting the facts in the case to the Council, Dr. Parsons read at length from the article "Easy Money From Borax and Potash" that appeared in *Chem. & Met.*, Aug. 25, 1924, p. 295. The Council by unanimous vote dropped Mr. Burnham from membership.

Los Angeles and Baltimore Next Meeting Places

The invitation of the Southern California Section to hold the 1925 summer meeting at Los Angeles was accepted and after discussion it was decided that the week of Aug. 3 would be most satisfactory. Arrangements will be made for a special train.

Baltimore was chosen for the spring meeting in preference to Tulsa, because of the short interval between the spring and summer meetings. It was suggested that it might be advisable to omit the spring meeting entirely, but this is contrary to the constitution, which states specifically that there shall be two meetings each year. Later an amendment was presented that would change this section of the constitution to read: "There shall be one annual meeting and may be one or more special meetings as determined by the Council." In accordance with the constitution, this must be referred to a committee to report to the Council within 3 months. Selection of the committee was deferred by President Baekeland.

Another amendment making it possible to select the time and place of meeting as long as 2 years in advance was read, the necessary committee was immediately appointed, a favorable report was rendered within an hour, and it was approved by the Council. The members will now be asked to vote on it.

The committee on classified membership requested that it be discharged. This was done and Secretary Parsons pointed out that misunderstanding had arisen because the name of this committee did not convey its real purpose. In its place there will be appointed a committee on entrance requirements to consider the basis for admission to membership.

H. L. Gray reported progress for the building committee, and George D. Rosengarten asked that the endowment committee be enlarged. This was done by making the building committee, the editors of the journals and the chairmen of all local sections members of this committee.

Prize Scholarships Awarded

H. E. Howe announced that the committee on prize essays had made the final awards of six 4-year scholarships at Yale to students from Hartford, Conn.; Commerce, Ga.; Dallas, Tex.; Phoenix, Ariz.; Centralia, Wash.; and Santa Rosa, Calif. Attention was called to the fact that in every case the winner was working his way through school and really in need of this assistance. It was also noted that although Arizona submitted a minimum number of essays in the state contest it nevertheless produced one of the winners of a national scholarship.

A motion making it possible for the secretary to use the designation business manager wherever necessary was carried.

A vote of thanks was extended to the Ithaca section and Cornell University for their hospitality.

Foreign Guests Address General Meeting

Formal welcome to Cornell was graciously extended by President Livingston Farrand in a short address that opened the general session Tuesday morning.

President Baekeland then introduced Sir Max Muspratt, of the United Alkali Co., Liverpool, who spoke on "Chemistry and Civilization." He directed attention to the fact that modern concentration of population would not have been possible without the aid of the chemist. Chemistry, physics and engineering are the foundations of modern civilizations and in his estimation chemistry is the greatest of the three, because it makes the others possible. Training to think in terms of atoms and to achieve in tons and tens of thousands of tons gives a perspective that is almost without parallel.

Development in chemistry has followed three general lines: dissection of nature, stimulation of nature and substitution of nature. In the last group there is much room for progress. We have not learned how to approach the efficiency of the plants, for example, as producers of complex compounds from the crudest of raw materials, at ordinary temperatures and without powerful reagents. We have in many cases been able to duplicate nature's products, but not her methods.

Hatred of waste being inherently repugnant to the chemist, it becomes his duty to inculcate the spirit into society as a whole. Indeed, it is becoming increasingly evident that the chemist must teach society the humanities as well as the value of science.

Prof. S. P. L. Sorensen, of the Carlsberg Laboratory, Copenhagen, followed with a distinguished contribution on "Serum Globulins," in which he demonstrated conclusively that the precipitation of these proteins by salts is in strict accordance with the requirements of the phase rule.

Sir Robert Robertson, president, chemical section, British Association for the Advancement of Science, discussed the chemistry of the trinitrotoluenes. During the war, the mononitrotoluene used for trinitrotoluene was not separated into its ortho, meta and para isomerides, with the result that the TNT was contaminated with about 4 per cent of unsymmetrical trinitrotoluenes derived from the meta-mononitrotoluene. These unsymmetrical bodies were most undesirable, as they reduced the melting point of the TNT and were less stable than the symmetrical compound. They also had the objectionable property of causing frothing, when mixed with ammonium nitrate containing pyridine or thiocyanates.

Inspection of Laboratory

Tuesday afternoon some of the novel features of the main lecture room of the new Baker Laboratory were demonstrated by Dr. L. M. Dennis, director of the department of chemistry, followed by a thorough inspection of the entire building. In many of the laboratories special exhibits had been arranged, those of Professor Bancroft on physical chemistry and of Professor Chamot on optical chemistry being particularly attractive and instructive. An account of the many interesting features of this new laboratory will be given in a subsequent issue.

Presidential Address

Illness prevented President Livingston Farrand of Cornell University from addressing the society Wednesday evening, as planned, and so limited the program to Dr. Baekeland's presidential address. He traced the development of the American Chemical Society from its modest beginning to its present prominent position and emphasized the important part that industrial chemical work has played in this advance. He ventured the prediction that in the near future more and more of the successful chemical enterprises would be directed by technical men. Training in business methods should form part of the chemist's equipment.

Obligations to society should also not be overlooked. If more scientists had followed the example of Pasteur, Huxley and Darwin, science might have exerted a far more humanizing influence. These men were not afraid to use simple language in presenting the story of their work.

New York City Engineers Conduct Defense Activities

Engineering Societies Building Transformed Into Center of Activities Communicating With All Parts of Country

Engineering co-operation was demonstrated Thursday, Sept. 11, when the Engineering Societies and the New York public utilities joined hands to help the army set up the headquarters from which to direct the industrial effort required to supply troops in emergency. As soon as the necessity for larger quarters was apparent, Captain H. W. Churchill of the regular army and executive officer of the New York ordnance district, notified Alfred D. Flinn, secretary of the United Engineering Societies, and was promptly given free use of their whole building and facilities. At noon word was flashed to Howard F. Thurber, president of the New York Telephone Co., that the district ordnance and air service offices would move to the Engineering Societies Building and that a switchboard with all necessary connections would be needed by 9 a.m. Within 5 hours the government's call was answered, and the fifth floor of the building was completely equipped to take care of all demands for telephone communication. Similarly, Major George M. Yorke, vice-president in charge of engineering of the Western Union Telegraph Co., was asked to provide telegraph facilities, and responded by installing the latest multiplex printing telegraph with a transmission speed of 600 words per minute.

Radio Communication Installed

Under supervision of General J. G. Harbord, president of the Radio Corporation of America, the office was quickly hooked up with the company's world-wide network and a latest type RCA radio ink recorder was set up to spell out communiqués and keep the office in continuous and immediate touch with the ever-changing military situation. Similarly C. H. Woodward, manager of the Globe-Wernicke Co., received an order to install furniture for "one office complete," and by 5 p.m. the whole shop was set up ready for business in the morning.

The newly established district ordnance office opened early Friday morning with everything in order for the transaction of business with companies whose facilities have been allocated by the War Department for survey with a view to determining availability for the manufacture of ordnance or aviation material. All plants allocated to ordnance had been tentatively subdivided into groups in accordance with their probable suitability for manufacturing various general classes of ordnance.

On arrival at the district office the representatives of manufacturers met the division and section chiefs particularly interested in their plants. The principal object of these small conferences was to establish contact between the government and the manufacturer, to enable the officers in charge to get a general idea of the manufacturer's facilities, and to enable the manufacturer to get an idea of what types of ordnance the government is considering assigning to their plants for production.

The division chiefs were also prepared to discuss the new standardized type of United States Government war contracts and to get the reaction of the manufacturer to the provisions embodied therein. The objects aimed at in these new forms are standardization, completeness, rapid production, justice to the contractor, with protection to the United States, and ease of settlement upon completion or termination.

Industrial Preparedness Stressed

Small group conferences were held throughout the day until 3 p.m., when representatives of manufacturers and reserve officers assigned to the district attended the general conference presided over by Judge Elbert H. Gary. General Robert Lee Bullard stressed the importance of industrial preparedness, not only as a means of lowering casualties in time of war but also as a means of reducing armament in time of peace.

Guy E. Tripp, chairman of the board, Westinghouse Electric & Manufacturing Co., responded on the behalf of American industry. Colonel James L. Walsh, Ordnance Reserve Corps, chief of the New York ordnance and air service districts, was another speaker. It was emphasized that without the help of American industry the War Department can do little or nothing, but that with the co-operation of the engineers of the country's industries satisfactory results can be accomplished.

At the close of the general conference the small group conferences were resumed and continued into the evening.

Steel Treaters Meet in Boston for Convention Next Week

At the sixth annual convention of the American Society for Steel Treating, to be held in Boston, Sept. 22 to 26, an attendance is assured of men eminent in the industry. In addition to the technical sessions, to be held mornings at headquarters at the Copley Plaza and afternoons at Commonwealth Pier, the largest exhibit of apparatus ever sponsored by the society is to be held in connection with the meeting. There are 200 exhibitors, 30 of them representing the steel makers, 30 representing all types of furnaces, while about 70 machine and machine tool builders have reserved space. More than 1,000 hp. will be required to work the display.

Among those planning to attend the meeting are Drs. Bulle and Bleibtrau of the German Iron and Steel Institute. The chairmen of the various technical sessions have been chosen as follows: Dr. George K. Burgess, director of the Bureau of Standards and president of the A.S.S.T.; Dr. Albert Sauveur, of Harvard University; Dr. Zay Jeffries, of the Aluminum Co. of America; Dr. John A. Mathews of the Crucible Steel Co. of America; Prof. H. M. Boylston, of the Case School of Applied Science; Lieutenant-Colonel A. E. White, of the University of Michigan; A. H. d'Arcambal, of the Pratt & Whitney Co.; Dr. H. B. Hollnagel, of the General Electric Co.

The annual smoker will be held in the ballroom of the Copley Plaza on Tuesday evening, while the banquet and dance will be held on Thursday evening at the same place. Governor Cox of Massachusetts, Mayor Curley of Boston and other speakers will address the banqueters.

The ladies' entertainment committee is planning to take care of 400 ladies. There are various activities planned, including a theater party, boat trips, motor trips about the city, a trip to Concord and Lexington, shopping tours, etc.

The committee on plant visitation has arranged trips to various New England manufacturing industries that it is felt to be of interest to the members and guests. These include the General Electric Co., at Lynn, the Thomas G. Plant Co., the Waltham Watch Co., the Naumkeag Manufacturing Co., a textile plant, and visits to Harvard University, Massachusetts Institute of Technology and the Charlestown Navy Yard.

News in Brief

New French Ammonia Company Founded—With Prof. Georges Claude among the founders, a new French company for the production of synthetic ammonia has been formed with a capital of 8,000,000 francs, the capital being fully paid up. Associated therewith is Yves Le Trocquer, former Minister of Commerce, and Louis Lion, administrator of the Banque de l'Union Parisienne.

Phillips Petroleum Co. Builds Carbon Black Plant—The Phillips Petroleum Co. has secured a permit from the Railroad Commission of Texas to erect a carbon black plant near Pioneer, in Eastland County. It is understood the plant, which will be the first erected by the Phillips Co., will cost approximately $300,000. The company is now completing an absorption plant in the Desdemona field of Texas with a daily capacity of about 15,000 gal.

Canada to Have Largest Kraft Paper Mill—What is stated to be the largest kraft paper mill in Ontario is to be constructed and operated on the Canadian National Railway near Foley by Continental Wood Products, Ltd., a subsidiary of the Continental Paper Bag Corporation of New York, according to an announcement made by L. E. Bliss, vice-president and general manager. The company will develop its own power from Kapuskasing River.

Airplanes Used to Conquer Mosquitoes—In the course of experimental poison dusting by means of airplanes for the control of the boll weevil in Louisiana the federal Department of Agriculture recently made an experiment with the use of the same method for the control of malaria-bearing mosquitoes. Paris green was the poison dust used to attack the mosquitoes and it was heavily diluted with tripoli earth. The experiment proved successful, as the planes could fly over parts of the swamps which would otherwise be inaccessible.

Washington News

Boll Weevil Infestation Less Than 25 Per Cent of Normal

Because of the unusually low temperatures occurring in the cotton belt during January, boll weevil infestation has been reduced in some areas to 5 per cent of normal. For the cotton belt as a whole the infestation is less than 25 per cent of normal. Nature thus has pointed the way, says General Amos A. Fries, head of the Chemical Warfare Service, to one of the most effective means of boll weevil control. There are heavy gases, General Fries points out, having many times the penetrativeness of any temperature occurring during the January cold snap. Because of the effectiveness of the low temperature in exterminating weevils under the cover in which they take refuge for the winter, the Chemical Warfare Service, in its experiments in weevil control, will pay particular attention to the laying down of heavy gases around the edges of fields and in nearby woodlands. He is convinced this will be found a very effective way in the control of the pest, since the heavy gas will penetrate into practically any cover available to the weevils and will reach them when they are concentrated in their winter quarters.

Paint and Varnish Production Gained in First Half of Year

The Department of Commerce announces that, according to data collected by the Bureau of the Census, there were produced during the 6-months period from Jan. 1 to June 30, 1924, 253,744,100 lb. of paste paints (comprising 177,259,000 lb. of white lead in oil, 5,960,000 lb. of zinc oxide in oil and 70,525,100 lb. of other paste paints); 45,122,500 gal. of ready-mixed and semi-paste paints; 34,718,300 gal. of varnishes, japans and lacquers, other than pyroxylin; and 1,430,700 gal. of pyroxylin (nitrocellulose) varnishes or lacquers.

The statistics for the first half of 1924 as compared with the second half of 1923 show increases of 32.1 per cent for paste paints, 17.7 per cent for ready-mixed and semi-paste paints and 5.7 per cent for varnishes, japans and lacquers, other than pyroxylin. The second half of 1923 as compared with the first half of that year, however, shows decreases of 22.3, 12.3 and 13.3 per cent, respectively, for these three classes of products. Comparison of the first half of 1924 with the first half of 1923 brings out increases of 2.7 per cent and 3.2 per cent, respectively, for paste paints and ready-mixed paints, and a decrease of 8.4 per cent for varnishes, japans and lacquers, other than pyroxylin. Pyroxylin varnishes were first reported in 1924, and therefore there are no comparative data for this class of products.

The statistics are based upon the reports of 519 establishments, of which 154 reported the manufacture of white lead in oil, 151 zinc oxide in oil, 302 other paste paints, 415 ready-mixed and semi-paste paints, 327 varnishes, japans and lacquers, other than pyroxylin, and 33 pyroxylin varnishes or lacquers.

Data are included for 43 establishments that reported for the last half of 1923 but not for the first half of 1924. For these establishments the production for the first half of 1924 has been estimated on the basis of the ratio which their production for the last half of 1923 bore to the total production of all establishments which reported for both periods. These 43 establishments produced, during the last half of 1923, only 4.1 per cent of the total paste paints, 5.2 per cent of the ready-mixed paints, and 6.8 per cent of the varnishes, japans and lacquers.

Containers Must Give Accurate Description of Imported Dyes

Instructions have been issued by the Treasury Department to all collectors of customs that after 30 days the provision of paragraph 28 of the 1922 tariff act, requiring that the immediate containers of imported dyes shall contain a true and accurate description of the contents, will be enforced without exception.

Heretofore the Treasury has permitted certain exceptions to be made in this provision of law upon application and proper showing of importers to the collector where imports are entered, by which it was possible to enter certain dyes, particularly some of the aniline colors, without the containers being marked, the marking being done while the merchandise was in bonded warehouse in the United States and before being withdrawn for consumption.

Inasmuch as nearly 2 years has elapsed since the enactment of the tariff act, the Treasury Department officials feel that all importers are sufficiently familiar with the terms of the law to comply with its requirements without hardship. Hence, the full provisions of paragraph 28 will be applied without exception after 30 days grace.

Potash Agreement Favors German Shipments of Sulphate

Further details on the potash agreement entered into by producers in Germany and in Alsace-Lorraine state that the French Alsatian plants will have assured 37.5 per cent of the United States market to German industry, reserving for themselves the remaining 62.5 per cent. Germany will enjoy a preference for the supply of sulphates and the right to ship up to 35,000 metric tons, while Alsace will be held down to 5,000 tons. Here the percentage changes—68.8 per cent for Germany, 31.2 per cent for France. In case one or the other of the parties does not furnish sulphates up to its quota the shortage may be supplemented by the other, who will pay over to the first named 15 per cent of the value of the supplementary quantity furnished. This represents, doubtless, an implied 30 per cent profit. In case of disagreement as to selling prices the matter will be submitted to the tribunal of The Hague.

At best the arrangement is considered but a modus vivendi for the term in question—3 years. Germany fears the enlarged scope of the Alsatian industry brought about by the addition of American capital, according to the Frankfurt *Gazette*. The opposite point of view is taken by other German interests, who claim that American credits are to be extended to German potash industries to the extent of $6,000,000. After 3 years it would seem as though a potash war might come into being.

Use of Para-dichlorbenzene Urged to Combat Peach Borer

The rapid spread of the peach borer resulted in $6,000,000 damage to the peach trees of the country this year. To combat the pest, the Department of Agriculture is recommending the use of para-dichlorbenzene. The department is urging that this chemical be applied to all peach trees this fall. It has been found to be very effective in the control of the insect and has the advantage of being harmless to humans and domestic animals.

Chemical Warfare Forces Measures to Safeguard Against War

That chemical warfare is going to be an important factor in forcing the world to take new safeguards against war has been emphasized in a striking manner at the assembly of the League of Nations. At the offices of the Chemical Warfare Service it was stated that the picture as drawn at Geneva is exaggerated to some extent, but officers of the Service were inclined to think it is justified in the effort to cause people to think more seriously of reducing the chances of war. They admit, however, that the time may not be far distant when it will be possible to do by means of chemicals all that has been claimed for them at the League meeting.

To make a city uninhabitable it would be necessary to drop on it about 30 tons of gas per square mile. Under present conditions this would be quite a task, even were a large city undefended. In case of war, however, any center of population would have planes to defend it as well as anti-aircraft guns. Unless the attaching force enjoyed unusual advantages it would have little opportunity to drop enough gas from aircraft to more than harass the population of a city. It also is recognized that new means of defense are found as new methods of offense are developed. At the present stage of the development of chemical warfare, even if the use of gas in attacks on the civilian population were countenanced, the most that could be accomplished would be the dropping of enough gas bombs to keep the population in a state of terror and uncertainty.

Utilizing Waste Fruit for Alcohol

Production of Alcohol and Valuable Byproducts From Raisins Described by John Mason

Waste and secondary fruit from Californian orchards and vineyards would be sufficient for the manufacture of all the alcohol needed in the United States, according to John Mason, of the Mason Byproducts Co., Sausalito, Calif., who addressed members of the California Section of the American Chemical Society at San Francisco on Sept. 5. The impracticability of entire dependence on such a source of supply is due to two causes: The fruit industry is a seasonal one, and plants depending on such a source of supply would be idle for 6 or more months in the year; comparatively few fruits can be dried cheaply and efficiently for all-year storage. Moreover, alcohol plants must be modified to suit the particular raw material used, and this would involve expense in changes and alterations, as well as erratic results because of a lack of uniformity. The problem is one of cheapness and regularity of supply of raw material.

Discussing the prospects of the utilization of other raw materials, Mr. Mason questioned the practicability of alcohol production from sawdust in the immediate future. Sugar beets would be suitable, but the seasonal supply would inhibit continuous operation.

Second-Grade Raisins Used

At the Mason Byproduct Co.'s plant a significant advance has been made by the manufacture of alcohol from second-grade raisins, using a method of preparation that is novel and that has given excellent results. Instead of adapting the equipment to the raw material, the latter has been processed in such a manner as to permit its treatment, from fermentation onward, in an almost identical manner to that adopted when molasses from the Hawaiian Islands was used, for which the plant was originally designed.

The success achieved in the United States in the production of alcohol by the scientific utilization of waste and second-grade products has resulted in the cheapening of production to a point that shows an advantage over any other country in the world, in spite of the high labor costs prevailing here. As furnishing an outlet for immense tonnages of such material as is being used at the present time, the development at Sausalito has been of considerable help to at least one large state foodstuff industry. It was pointed out that the molasses-alcohol industry depended to a large extent on the manufacture of salable byproducts. The recovery of carbonic acid gas from the fermentation vats at Sausalito was practiced at an early date, the use of permanent heads incidentally resulting in a 10 per cent increase in the amount of alcohol produced. A special chemical process was developed for the purification of the gas, which has proved highly successful.

The uses for carbon dioxide gas are increasing. In addition to the common use in carbonated beverages, the purified gas has been found suitable for the frothing of ice cream, producing a larger bulk of the material with a pleasing taste. The gas, germ free, is an excellent medium in which butter and fruit can be preserved from deterioration for periods far exceeding those possible when contact with the air is permitted.

Alcohol and carbon dioxide are both essential for naval supremacy, the latter being used on shipboard in liquid form for refrigeration purposes. Immense amounts of alcohol are also used with shellac, for the preservation of deck wood in the navy, and for many industrial purposes. The importation of shellac amounts to about 17,000,000 lb. per annum, and 1 gal. of alcohol is needed for each 2½ lb. of this. Potash was a byproduct recovered from the molasses waste during the war; activated carbon was another.

Many Byproducts Recovered

Byproducts from the manufacture of alcohol from raisins include carbonic acid, fusel oil, isopropyl and propyl alcohols, ether and ethyl acetate. The recovery of raisin oil, from the seeds and stems, is practicable. The final mash product is now being used for cattle feed on an experimental scale. The stills at the Sausalito plant have a capacity of 16,000 gal. each. The first distillation brings over the "whole family" of alcohols; the product is then redistilled. Fermentation of the raisin mash follows customary practice, the temperature control being important, however, as affecting the character of the alcohol produced.

Experiments Prove Fertilizing Value of Sulphur

Sulphur has a fertilizing action in excess of that heretofore thought to be the case, in the opinion of those who have conducted extensive experiments with it in France. It is claimed that the use of sulphur in the soil has resulted in substantial increases in the yields of potatoes, tomatoes, turnips and garden truck generally. In one set of experiments the yield of potatoes was increased 15 per cent and that of turnips 30 per cent. Experiments conducted by the government agricultural service showed an increase of 1,300 kg. of tomatoes on a hectare of land on which 199 kilos of sulphur had been added to the soil, in addition to the regular fertilizer. It has been found that sulphur increases the starch content of vegetables and promotes vigorous foliation. The sulphur is added to the soil in the autumn, as it breaks down gradually.

It had been demonstrated before the war that sulphur had value as a fertilizer in addition to its bacterial influence, while the sulphuric acid derived from the sulphur aided in the freeing of potash. It also is contended that the recent experiments show that the antiseptic action of sulphated hydrogen and of sulphites would affect the protazoa, whose disappearance would leave the field free for the action of useful bacteria.

Trade Notes

The executive committee of the Manufacturing Chemists Association will meet at India House, Hanover Square, New York, Sept. 17. The meeting is of importance, since it is the first since the vacation season.

Major Morris C. Willet has been instructed to relieve First Lieutenant Joseph F. Battley as executive officer of the Second Chemical Warfare Service procurement district, with headquarters at New York. Lieutenant Battley goes to the Harvard School of Administration for a special course.

In an unfair competition complaint issued by the Federal Trade Commission, the Double A Platinum Works, Inc., of New York City, is charged with misbranding certain of its products. The firm is a manufacturer of unfinished metal jewelry pieces known to the jewelry trade as "findings." Such "findings," the citation states, are made of platinum alloyed with other metals.

Exports of heavy chemicals from Germany during June, 1924, amounted to 128,389 tons, compared with 222,069 tons in May. Imports of chemical fertilizers increased from 14,097 tons in May to 27,676 tons in June.

The golf tournament of the Chemical Salesmen's Association, which was scheduled to take place at the Westchester Hills Golf Club on Sept. 9, was interrupted by rainy weather after a few holes had been played. Prizes were awarded on the averages for the holes played, with A. H. Pierce holding low gross score. E. J. Barber and Ralph Dorland were tied for low net and Hugh Craig won the kickers handicap.

The Gold Dust Corporation will soon start on work of erecting a factory at Canton, Md. The first unit will cost $1,000,000.

John McKesson, Jr., president of McKesson & Robbins, Inc., manufacturer of chemicals and drugs in New York, died on Sept. 5.

A new palm oil refining plant, equipped with modern machinery, with a normal capacity of crushing 16,000 tons of palm nuts annually but capable of expansion to 20,000 tons, has been established in Bordeaux, France, according to a report of Consul Lucien Memminger, at Bordeaux. This plant has opened up a new avenue of trade in palm nuts from French West Africa. The French importation of oilseeds from French West Africa now amounts to about 100,000 tons annually.

Internal Revenue on Distilled Spirits Declined

Internal revenue to the amount of $27,580,380.64 was collected on distilled spirits during the fiscal year ended June 30, 1924. This is a decrease of $2,773,626.24 as compared with the preceding fiscal year. Opium and coca leaves produced $1,057,066.33 of internal revenue during the fiscal year just closed, an increase of $43,800.07 over the preceding fiscal year.

Men You Should Know About

ERNEST ASHTON, chemical engineer for the Lehigh Portland Cement Co., Allentown, Pa., sailed for Europe, Aug. 27, on a business trip. He will be gone 5 weeks.

M. G. BABCOCK, of the refractories department of the Pittsburgh Plate Glass Co., Pittsburgh, Pa., has returned to the city following a 3-weeks trip of inspection of glass plants in the eastern and central sections of the country.

CLARENCE A. BRADFORD, vice-president and assistant general manager of the Rex Paper Co., Kalamazoo, Mich., for the past 7 years, has resigned, effective Oct. 1, to establish a paper mill of his own. He will organize a company, of which he will act as president and general manager.

JOHN B. BUNN, assistant petroleum engineer, United States Bureau of Mines, heretofore located at Ardmore, Okla., has recently been transferred to Muskogee, Okla.

J. PARKE CHANNING, vice-president and consulting engineer of the Miami Copper Co., New York, has returned to the city after a month's absence.

Dr. N. B. HOFFMAN, metallurgist, gave an interesting address before the members of the Pittsburgh, Pa., chapter of the American Society for Steel Treating at the William Penn Hotel, Sept. 2, on the subject "Phases of Heating Tool Steel."

LOUIS W. HUBER, of Urbana, Ill., has become a member of the faculty at the Carnegie Institute of Technology, Pittsburgh, Pa., as instructor in the department of mining and metallurgical engineering.

JULIUS KAHN, president of the Truscon Steel Co., Youngstown, Ohio, has returned to his desk following an extended trip abroad.

PAUL LEONI, managing director of the Iron & Ore Corporation of America, New York, has returned to the city after an absence of several months in Europe.

BENJAMIN E. LINDSLEY, a graduate of the Massachusetts Institute of Technology, has been engaged by the United States Bureau of Mines at the Bartlesvil'e, Okla., experiment station, to make a special investigation of the use of vacuum in oil wells.

R. L. MANN, formerly with Tate-Jones Co., is now with the Combustion Engineering Corporation, in the Hermansen furnace department.

VICTOR R. MORRIS, who has been in the employ of the Virginia-Carolina Chemical Co. at its Steel Cities Chemical Co. plant since October, 1922, has been promoted to superintendent of the Virginia Chemical Co.'s plant at Opelika, Ala.

SAMUEL H. NEWFIELD, formerly with the Miner-Edgar Co. as superintendent of the alcohol products division at Monmouth Junction, N. J., has accepted the position of vice-president and general manager of the Texcel Chemical Co., Inc., of New York.

J. WALTER SAYBOLT has been appointed manager of the lubrication division of the domestic sales department of the Standard Oil Co. of New Jersey. Mr. Saybolt comes to New York from the Baltimore division, where he has been manager of lubrication sales since March 15, 1919. The new manager is a son of George M. Saybolt, former head of the Standard Inspection Laboratory, who retired in 1919.

H. G. SCHURECHT, ceramic engineer, heretofore located at the Mellon Institute, Pittsburgh, Pa., has accepted a position with the Bureau of Standards, Washington, D. C.

Prof. W. E. S. TURNER, D.Sc., M.Sc, secretary of the Society of Glass Technology, Sheffield, England, was the guest of honor at a dinner given by the members of the Pittsburgh, Pa., Section of the American Ceramic Society at the local University Club, Sept. 4.

AXEL VÖHTZ, of Inglstad, Sweden, is now with the Combustion Engineering Corporation, New York office, in the Hermansen furnace department.

Calendar

AMERICAN CERAMIC SOCIETY, Los Angeles, Calif., Oct. 6 to 7.

AMERICAN ELECTROCHEMICAL SOCIETY, Detroit, Oct. 2 to 4.

AMERICAN FOUNDRYMEN'S ASSOCIATION, Milwaukee, Wis., Oct. 11 to 16, 1924.

AMERICAN GAS ASSOCIATION, Steel Pier, Atlantic City, N. J., Oct. 13 to 17.

AMERICAN INSTITUTE OF CHEMICAL ENGINEERS, Hotel Shenley, Pittsburgh, Pa., Dec. 3 to 6.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS, Pasadena, Calif., Oct. 13 to 17.

AMERICAN INSTITUTE OF MINING AND METALLURGICAL ENGINEERS, Birmingham, Ala., Oct. 13 to 15.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS, New York, Dec. 1 to 4.

AMERICAN SOCIETY OF REFRIGERATING ENGINEERS, New York, Dec. 1 to 3.

AMERICAN SOCIETY FOR STEEL TREATING, Boston, Sept. 22 to 26.

ASSOCIATION OF OFFICIAL AGRICULTURAL CHEMISTS, Hotel Raleigh, Washington, D. C., Oct. 20 to 22.

EDWARD HART CELEBRATION AND INTERSECTIONAL MEETING OF AMERICAN CHEMICAL SOCIETY, Easton, Pa., Oct. 16 to 18.

FRANKLIN INSTITUTE CENTENNIAL, Philadelphia, Sept. 17 to 19.

MANAGEMENT WEEK. Auspices of American Society of Mechanical Engineers, New York City, Oct. 20 to 25.

NATIONAL EXPOSITION OF POWER AND MECHANICAL ENGINEERING, Grand Central Palace, New York, Dec. 1 to 4.

NATIONAL SAFETY COUNCIL, Louisville, Ky., Sept. 20 to Oct. 3.

PACIFIC COAST GAS ASSOCIATION, Santa Barbara, Calif., Sept. 15 to 19.

RENSSELAER POLYTECHNIC INSTITUTE, Centennial Celebration, Troy, N. Y., Oct. 3 and 4.

SOUTHERN EXPOSITION, Grand Central Palace, New York, Jan. 19 to 31, 1925.

TECHNICAL ASSOCIATION OF THE PULP & PAPER INDUSTRY, Hotel Statler, Buffalo, N. Y., Oct. 14 and 15.

HOWARD WOOD, JR., has been elected president of the Alan Wood Iron & Steel Co., Conshohocken, Pa., operating blast furnaces and other properties, succeeding Richard G. Wood. The new president formerly acted as vice-president of the company, and will be succeeded in this capacity by Alan D. Wood, son of the retiring president.

Obituary

Dr. JOSEPH E. GILPIN, for a number of years professor of chemistry at Johns Hopkins University, Baltimore, Md., died Aug. 25, at Chestertown, Md., aged 58 years. He was born in Baltimore and studied at the university in which he became a professor, receiving the degree of bachelor of arts in 1889 and that of doctor of philosophy in 1892.

FRANCIS CAMPBELL MABEN, organizer of the Sloss Iron & Steel Co., died at his home at Atlantic City, N. J., Aug. 31, at the age of 87. About 8 years ago he suffered a complete breakdown and closed his active business affairs. The company which he formed later became the Sloss-Sheffield Steel & Iron Co. Mr. Maben is survived by one son.

WILLIAM H. TENNEY, of Boston, a prominent rubber goods manufacturer, president of the Clifton Manufacturing Co., Jamaica Plain, Mass., died Aug. 27, at Wellesley Hills, Mass., where he had been spending the summer, aged 81 years. He is survived by his wife and two sons.

Portland Cement Association Organizes Research Staff

The Portland Cement Association has made further progress in the organization of its research staff which is working in co-operation with the National Bureau of Standards at this latter institution. Since the first of June this work has been under the immediate charge of Dr. R. H. Bogue, who serves as research director for the association. Research associates stationed at the bureau for this work are W. C. Hansen, F. W. Ashton, William Lerch and L. T. Brownmiller. The work is under the general administrative direction of P. H. Bates, chief of the industrial and engineering materials division of the bureau.

Eighth Supplemental List of Standards of Dye Strengths

The Treasury Department has issued its eighth supplemental list of standards of strength of coal-tar dyes. This last list enumerates thirty-six dyes, being the longest of the supplemental lists issued since the general list was revised early in June. The list of standards is used in assessing the specific duty of 7c. per pound on imported coal-tar dyes, the specific duty being applied in the ratio that the strength of the importation bears to the strength of similar commercial imports prior to July 1, 1914.

Market Conditions

Consuming Demand for Chemicals Holds Recent Gains

Buying in Spot Market Eases Off, but Contract Withdrawals Continue and Inquiry Extends to Future Positions

CONSUMERS of chemicals and allied products who have adhered to a policy of buying from month to month were reported to be covered for the present and their absence from the spot market resulted in a slower call for spot materials in the past week. Contract withdrawals held up to recent standards and interest was shown in forward positions so that the market retained its appearance of improvement.

Contract prices for alkalis are being awaited with interest but no intimation of a change has yet been given and opinions in trade circles favor very little if any departure from the contract levels which have been prevailing. A new selling schedule for potash salts was made public during the week. The prices are the same as those quoted last year but discounts vary and thus make a little change which is in favor of buyers. According to reports from abroad the Franco-German potash agreement allots to Germany a larger share of shipments of sulphate of potash than is the case in the other potash salts.

The weighted index number for the week again shows a material loss. A short time ago cottonseed oil, linseed oil and some other important allied products turned upward in price and brought the weighted number to higher levels. In the past three weeks these commodities have steadily declined in value and have exerted a corresponding influence on the index. Reviewing prices for chemicals as disassociated from allied products, there has been only moderate fluctuations with the general trend toward a steadier if not a higher basis.

Imported chemicals have changed but little in position. In some instances they dominate the market, in other cases they are competing with domestic makes and thus have considerable influence in determining current market values.

Acids

While new business has not been heavy there has continued a freer delivery of sulphuric acid and the tone of the market is becoming steadier as surplus stocks are being drawn upon. Prices are still a little irregular according to seller but price concessions which were given in the summer months are no longer available. Muriatic acid is following sulphuric and is in better demand. Nitric acid has been steadied by producing costs as well as by a larger outlet in consuming industries. Having passed the active consuming season citric and tartaric acids are quiet and holdings of imported selections are showing an easy price tone. Oxalic acid has fluctuated somewhat in price according to seller. Any real recovery is prevented by the fact that selling competition has not run its course.

New Contract Prices for Potash Salts—Nitrite of Soda in Limited Supply—Caustic Potash Firmly Held — Arsenic Weak and Dull — Good Demand for Sal Ammoniac — Epsom Salts Higher—Barium Carbonate Easier — Imported Copper Sulphate Higher for Shipment — Formaldehyde Market Irregular

Moderate improvement is reported by sellers of technical tannic acid with U.S.P. offerings rather quiet. Corroders are taking fairly normal amounts of acetic acid and other users also are in the market in a more active way. Hydrofluoric acid has sold more freely but sales have not run to large lots.

Potashes

Bichromate of Potash—According to official figures exports in July were on an average price of slightly less than 8.64c. per lb. This would bear out reports that comparatively low prices were being named on export business. The present market is reported as quiet but tonnage is admitted to have gained. Prices remain at 8¾@9c. per lb.

Carbonate of Potash—While imports have been smaller than a year ago, the totals for the 7 months ended July being 3,551,151 lb. in 1924 and 5,935,979 lb. in 1923, there has been no scarcity of offerings and prices in trading have favored buyers. Calcined 80-85 per cent has sold at 5c. per lb. and hydrated was offered at 5¼c. per lb.

Caustic Potash—That imported caustic has sold more freely this year is shown by the fact that imports for the first 7 months of the year were 6,855,776 lb. as against 5,961,503 lb. in the corresponding period of last year. The spot market has been strengthened as a result of better demand and because of higher replacement values. It was stated that 6¾c. per lb. might be done but the general asking price was 6¾c. per lb. Shipments are offered at 6¾c. per lb.

Muriate of Potash—Following the recent agreement between French and German producers, it was expected that contract prices would be announced on muriate of potash. This announcement was made last week and included the various potash salts which enter into the fertilizer trade. The price schedule remains the same as that formerly in force but changes in discounts were made. The schedule is as follows:

	Per Ton
Muriate of potash 80@85 per cent, bags	$34.55
Sulphate of potash 90@95 per cent basis 90 per cent, bags	45.85
Sulphate of potash magnesia or double manure salts 48 per cent, bags	26.35
Manure salts 30 per cent, bags	19.03
Manure salts 30 per cent, bulk	17.03
Manure salts 20 per cent, bags	12.55
Manure salts 20 per cent, bulk	10.55
Kainit 14 per cent, bags	10.25
Kainit 14 per cent, bulk	8.25
Kainit 12.4 per cent, bags	9.75
Kainit 12.4 per cent, bulk	7.75

These quotations are c.i.f. Atlantic ports and are subject to discounts ranging from 5 per cent on purchases of 50 tons to 10 per cent on purchases of 500 tons of pure potash. A rebate of 5 per cent also is given on orders placed prior to October 1 and calling for immediate shipment.

Sodas

Caustic Sodas—Sales for export were made last week as low as 2.80c. per lb. Some sellers were offering at 2.85c. per lb., f.a.s., in the latter part of the week. The decline in export business is exemplified in official returns which place exports for the first 7 months of this year at 52,977,417 lb. as compared with 69,991,766 lb. in the corresponding period of last year. Exports from the United Kingdom in the same periods were 124,006,848 lb. this year and 100,876,608 lb. last year. There is a good movement of caustic from works to domestic consuming plants and keen interest is shown in contract prices for next year, but no change has yet been made and 3.10c. per lb., car lots, at works holds as the contract price.

Fluoride of Soda—Buyers were in the market for moderate amounts and offerings were reported to be in firm hands. Spot values were maintained at 8½c. to 9c. per lb. with the inside figure by no means general. Replacement costs were said to be close to 9c. per lb.

Nitrite of Soda—The position of this material, from a standpoint of import duty, is still in doubt and in the meantime domestic nitrite does not appear

to be competing strongly with the imported. The latter is firmer with 9c. per lb. given as an inside price and up to 9¼c. per lb. asked. Imports for the 7 months ended July were 5,052,080 lb. as compared with 3,781,708 lb. in the corresponding period last year.

Nitrate of Soda—Reports from Chile state that although sales of nitrate dropped off somewhat during August as compared with the previous month, they were better than in August, 1923, and the total of sales for delivery in the current nitrate year, which began on July 1, is large. During the first 15 days of August 200,000 metric quintals were sold (1 metric quintal equals 100 kilos, or 220.4 pounds). Exports of nitrate during the same period rose to 1,290,000 metric quintals, or 129,000 metric tons, compared with exports of 104,000 tons during the corresponding period of July. Production continues at a high level. Demand for spot nitrate has been quiet and $2.50 per 100 lb. is more or less a nominal figure.

Miscellaneous Chemicals

Arsenic—Buying interest has practically disappeared and there is no stable price which could be given as representing a trading basis. Holders ask 7¼@7½c. per lb. for spot material but it is admitted that 7c. per lb. can be done and the market has worked into a position where buyers could almost name their own price.

Barium Carbonate—Arrivals from abroad have not found a ready market and prices have been gradually easing off. Spot material could have been picked up last week at $57 per ton. Barium chloride also has been quiet and spot offerings are available at $73 per ton. Barium nitrate has weakened and was offered at 7¼c. per lb.

Copper Sulphate—This material has been featured by higher prices for shipment from foreign markets. Importers stated that cables quoted 4.40@4.50c. per lb. There was not much buying interest and trading in all positions was inactive. Domestic sulphate is quoted at 4.50@4.80c. per lb. according to seller and make.

Epsom Salts—Improvement was noted in this market and consumers were reported to have taken on some good sized lots. Prices were firmer and sales of imported were made at $1.35 per 100 lb. with many holders asking $1.37½ per 100 lb.

Formaldehyde—This material held an irregular position. In some quarters 9c. per lb. was quoted as an inside figure for round lots and the market was described as firm. There were reports, however, of sales under 9c. per lb. and on firm bids it was stated that 9c. per lb. could be shaded throughout the week.

Sal Ammoniac—A fairly active period was reported for this chemical. Sellers have been eager to dispose of stocks and an easy price tone has continued because of continued offerings for shipment at 5¾@5¾c. per lb. Spot material was quoted in the market at 6@6¼c. per lb.

"Chem. & Met." Weighted Index of Chemical Prices

Base = 100 for 1913-14

This week	152.66
Last week	156.87
Sept., 1923	172.00
Sept., 1922	148.00
Sept., 1921	147.00
Sept., 1920	267.00
Sept., 1919	272.00
Sept., 1918	278.00

Crude cottonseed oil broke sharply, and this accounts for much of the decline in the weighted index number. Heavy chemicals, taken as a whole, showed no decided price tendency.

Zinc Oxide—No price changes were named by first hands, the undertone being about steady in sympathy with the metal. American process, lead free, held at 7¾c. per lb. in bags, carload lots.

Alcohol

There was no change in the general position of the market. Demand has been holding up well and with a firm situation in basic materials the outlook continues to favor sellers. Special denatured, formula No. 1, is held at 47c. per gal., in drums, carload lots. Completely denatured, formula No. 5, is quoted at 46c. per gal.

Producers of methanol report a steady market, with business showing improvement. The selling schedule was unchanged on the basis of 76c. per gal. for the 97 per cent, and 74c. per gal. for the 95 per cent, cooperage basis, carload lots.

Coal-Tar Products

Better Outlook for Coke Points to Increased Production of Crudes—Inquiry Shows Improvement—Spot Phenol Firmer

REPORTS on the condition of trade in the iron and steel industries were more optimistic and business in by-product coke has started on the upgrade. First hands expect a larger output of coal-tar crudes this fall. Spot holdings, however, continue moderate and fairly steady undertone prevails for the more important items in the list. Benzene for immediate delivery was quite firm, but no change occurred in the trading basis. More buying interest was apparent in solvent naphtha. A feature in the market was the firmer position of U. S. P. phenol, several sellers turning down bids at the old level of prices. Uncertainty still obtains in cresylic acid and naphthalene, offerings being large and competition on the selling side keen. Demand for aniline oil has increased.

Aniline Oil and Salt—Sales went through on the basis of 16c. per lb., drums extra, carloads, nearby delivery, indicating that the market underwent no change so far as prices were concerned. Inquiry has improved and the tone at the close was steady. Aniline oil for red was nominally unchanged at 40c. per lb. Prices for aniline salt were irregular, ranging from 20@22c. per lb., according to quantity and seller.

Benzene—Offerings of benzene for immediate delivery were light and this caused prices to hold comparatively steady. Operators expect production to increase before long and this may influence prices. The quotation on the 90 per cent grade held at 23c. per gal., tank cars, with the pure at 25c. per gal., tank cars, f.o.b. works. Exports of benzene from the United Kingdom for the 7 months ended July 31 amounted to 1,093,260 gal., which compares with 632,376 gal. for the corresponding period a year ago.

Beta-naphthol—First hands say that demand has picked up slightly. Prices were steady, but nominally unchanged, ranging from 24@26c. per lb., depending upon the quantity and delivery.

Creosote—Foreign markets are dull and easy. Manchester quotes from 5½@5¾d. per gal., bulk basis, works. Exports of creosote oil from the United Kingdom for the 7 months ended July 31 amounted to 24,024,640 gal., which compares with 28,233,554 gal. for the corresponding period a year ago. Continental sellers have been more aggressive, and this, in part, accounts for the loss in British shipments.

Cresylic Acid—The market was barely steady, occasional lots coming out at concessions. Nominally the 97 per cent grade held at 63@65c. per gal., with the 95 per cent grade at 59@61c. per gal.

Naphthalene—Buying interest was restricted mainly to the grades usually taken by intermediate makers. Refined naphthalene was dull and selling pressure continues, causing prices to differ greatly. White flake was offered at 4½@5c. per lb., with balls at 5@5¼c. per lb. Chips settled around 4@4¼c. per lb. Crude, to import, was nominal at 2c. per lb. for the 75@77 per cent material.

Phenol—There was a firmer market for U. S. P. phenol for immediate delivery and several handlers refused to shade 26c. per lb., in drums. Others, however, continued to quote the market unchanged at 24@25c. per lb., the inside figure obtaining on round lots only. Phenol for shipment was steady at 24@25c. per lb.

Pyridine—Foreign market again advanced, and this strengthened the ideas of sellers here. In some quarters spot material was nominal at $4.50 per gal.

Toluene—Producers reported business on the basis of 31c. per gal., in drums, carload lots, works. The tank car quotation held at 26c. per gal., f.o.b. point of production.

Xylene—Demand was slow and scattered lots were on the market at concessions. Stocks were not large, yet sellers seemed anxious to move supplies. Commercial xylene was available at 25@27c. per gal., tank car basis, f.o.b. works. The 5 deg. grade was nominal at 38@40c. per gal., tank cars.

Vegetable Oils and Fats

Crude Cottonseed Oil Sells at New Lows, but Steadies Later on Smaller Offerings—Flaxseed Report Favorable

EARLY in the week crude and refined cottonseed oil sustained heavy losses on a bearish interpretation of the latest report on the condition of the cotton crop. Offerings of nearby crude were large enough to exert pressure on the market. The decline, however, stimulated buying interest on the part of consumers. On the dip in prices quite a little export business was worked. Paint makers and printing ink manufacturers were buyers of linseed oil for future delivery at lower prices. China wood oil advanced on unfavorable political news from the Far East. Corn oil, crude, was weak in sympathy with cottonseed oil. Palm oils were steady. Coconut oil sold at a decline in price, both here and on the Pacific coast.

Cottonseed Oil—Sentiment at the close was mixed. The latest report on the condition of the cotton crop indicates a yield of 12,787,000 bales, which, according to trade authorities, should produce enough oil to warrant lower prices for the next year. Against this bearish view traders had to consider the strong situation in pure lard. The premium now obtaining for the hog product seems to insure better business in cottonseed oil and its products. The sharp decline in oil prices, which occurred early in the week, aroused buying interest, especially in nearby material, and operators expect large shipments to consumers during the next month. The decline actually brought in export business, and, by Thursday, it was estimated that more than 3,000 bbl. had been booked for shipment to England and the Continent. Crude cottonseed oil for September shipment from mills located in the Southeast sold at 8@8¼c. per lb. Texas reported business at 8c., mills, September delivery, and 7¾c. per lb., mills, October delivery, tank car basis. Late in the week, 8¼c. was bid in the Southeast, and 8¼c. was bid in Texas, for September crude. Prime summer yellow oil, September option, settled at 10.80@10.85c. per lb., with October at 10.35@10.37c. per lb., and December at 9.90@9.92c. per lb. Pure lard in the Chicago market was firm, in sympathy with corn, with the cash position nominal at 13.60c. per lb.

Linseed Oil—Crop reports were bearish, but the seed markets held comparatively steady, cold weather creating a feeling of uncertainty regarding the actual outcome of the harvest. The domestic crop was officially estimated at 29,000,000 bu., while Canadian production was placed at 10,846,000 bu., a gain of 600,000 bu. and 2,220,000 bu., respectively, compared with the estimates made a month ago. The oil market was unsettled on freer offerings by leading crushers. Inquiry from consumers was fair and this resulted in some keen competition among sellers, as most of the call for oil was for future delivery. Sales of round lots took place at 87@88c. per gal., cooperage basis, November-April delivery. Prompt shipment oil sold at $1@$1.01 per gal., carload lots, cooperage included, while October was offered at 92c. per gal. One crusher offered late September delivery oil at 97c. per gal. Crop news from the Argentine was more favorable, beneficial rains falling in the flaxseed belt. At Buenos Aires the October option was lowered to $1.99½ per bu. Duluth quoted September flaxseed at $2.32⅝ per bu., with October at $2.28 per bu., and December at $2.23⅝ per bu. Arrivals of new crop seed in the Northwest were larger, but crushers were in the market at all times, being badly in need of supplies. Cake for export was firm at $45.50 per ton, f.a.s. New York.

Condition of Flaxseed Crop Improves in August

Estimated production of flaxseed in the United States was increased 600,000 bu. in the past month, according to the Sept. 1 report of the Department of Agriculture. The indicated yield is placed at 29,000,000 bu., with condition at 82.4 per cent of normal. The yield per acre was estimated at 8.6 bu., which compares with 8.4 bu. a month ago. Condition of the crop on Sept. 1, with estimated yield, and a comparison with former crops, follows:

	Condition	Yield (bu.)
Sept., 1924*	82.4	29,000,000
Aug., 1924*	86.4	28,400,000
July, 1924*	86.8	25,900,000
Final, 1923	...	17,429,000
Final, 1922	...	10,375,000
Final, 1921	...	8,029,000

*Preliminary forecast.

The Canadian official crop estimate for Sept. 1 places the yield at 10,846,000 bu., which compares with 8,626,000 bu. a month ago and 7,139,500 bu. a year ago.

China Wood Oil—Political developments in China were unfavorable and prices for oil were higher and more or less nominal at the close. Early in the week spot oil in bbl. sold at 15c. per lb., but later as high as 16c. was asked. On the Pacific coast sales took place on Monday and Tuesday at 13@13½c. per lb., tank cars, but later prompt oil was raised to 14@14½c., tank cars.

Corn Oil—Crude corn oil sold lower at 9c. per lb., tank cars, Chicago, with the market unsettled on the uncertain position of cottonseed oil.

Coconut Oil—Offerings of Manila oil were reported for future delivery at 8¼c. per lb., bulk basis, c.i.f. Pacific coast ports. Several cars of Ceylon type oil sold for September-October shipment from the coast at 8⅝c. per lb. In New York Ceylon type oil settled at 9¼c. asked, sellers' tank cars, f.o.b. terms, with offerings light.

Olive Oil Foots—There were offerings at prices ranging from 9½@9¾c. per lb., immediate delivery. Foreign markets were quite steady and the undertone here was firm.

Palm Oils—Lagos oil for September delivery was offered at 8.30c. per lb., with futures at 8¼@8½c., according to seller. French Lagos for nearby delivery was available at 8¼c. per lb. with Niger oil at 7.70c. per lb., September-October shipment from Africa. Inquiry was moderate only.

Other Oils—Refined rapeseed oil on spot sold at 86@86½c. per gal., with futures nominal at 85@85½c. per gal. Refined sesame oil on spot sold at 13½c. per lb. Soya bean oil containing 5 per cent perilla was offered for prompt shipment from the Pacific coast at 10½c. per lb., tank cars, duty paid. Crude menhaden oil sold recently at 50c. per gal., tank cars, fish factory, but holders now ask from 52½@55c. per gal.

Tallow, Etc.—Moderate business took place in extra special tallow at 8¼c. per lb., ex plant. The market was steady, but only one large soaper showed buying interest. Greases were easier, choice yellow selling down to 7⅞c. per lb. Oleo stearine was quiet at 12⅜c. asked. Lard compound settled at 13⅞@14¼c. per lb.

Miscellaneous Materials

Antimony—Developments in China were unfavorable and holders here advanced their selling views. Chinese brands closed at 10¾@11c. per lb., an advance of ¼c. Cookson's "C" grade closed at 13@13½c. per lb. Chinese needle, lump, nominal at 8¾@9c. per lb. White oxide, Chinese, 99 per cent, 11½@13c. per lb., according to seller.

Barytes—Importations from the Continent have been larger, but this had little influence upon the domestic product. Crude held at $8 per ton, f.o.b. mines, Missouri, and at $9 per ton, f.o.b. mines, Georgia. Water ground, floated, settled at $23@$24 per ton, carload lots, f.o.b. St. Louis.

Glycerine—There was a fair demand for crude and refined grades of glycerine and the market ruled firm at the recent advance. Chemically pure was maintained by leading refiners at 19@19½c. per lb., in drums, with dynamite at 18½@18¾c. per lb., the inside figure prevailing in the Middle West. Soap lye crude, basis 80 per cent, was firm at 12¼@12½c. per lb., loose, carload lots.

Naval Stores—Spirits of turpentine were unsettled on quiet trading and the market closed at 89c. per gal., a decline of 2c. for the week. Rosins, on the other hand, were firm and slightly higher prices were named on practically all grades. Demand was good. On the lower grades sellers quote from $6@$6.20 per bbl.

White Lead—There was no change in the market for pig lead, and this served to steady prices for pigments. Corroders reported a normal volume of business in white lead and the market held at 10c. per lb., on the dry basic carbonate and 9½c. per lb., on the dry basic sulphate.

Imports at the Port of New York

September 5 to September 11

ACIDS—Boric—200 bg., Leghorn, Pacific Coast Borax Co. **Citric**—100 bbl., Messina, Order. **Formic**—154 demijohns, Hamburg, A. Klipstein & Co.; 80 pkg., Antwerp, Roessler & Hasslacher Chem. Co.

ALBUMEN—50 csk., Shanghai, J. Lowe Co.; 101 cs., Shanghai, etc., Stein, Hall & Co.; 110 cs., Shanghai, Order.

ALCOHOL—8 dr. amyl, Hamburg, Irving Bank-Col. Trust Co.

ANTIMONY REGULUS — 50 csk., London, Brandies Goldschmidt.

ARSENIC — 500 cs. Yokohama, Meteor Products Co.; 181 bbl., Tampico, American Smelting & Refining Co.; 200 csk. white, Hamburg, Ore & Chemical Corp.

BARIUM CHLORIDE — 93 bbl., Hamburg, Roessler & Hasslacher Chemical Co.; 55 bbl., Hamburg, A. Klipstein & Co.; 73 csk., Hamburg, E. Suter & Co.; 222 csk., Antwerp, Guaranty Trust Co.

BARIUM CARBONATE—500 bgs., Hamburg, Seaboard National Bank.

BARIUM NITRATE—29 bbl., Hamburg, Seaboard National Bank.

BARIUM PEROXIDE—123 bbl., Hamburg, W. A. Brown.

BARYTES—29 bbl. and 100 bg., Hamburg, A. Klipstein & Co.; 34 csk., Hamburg, A. Hurst & Co.; 300 bg., Rotterdam, E. L. Bullock & Co.; 1,000 bg., Genoa, National City Bank; 1,000 bg., Genoa, Order.

BLEACHNG POWDER—75 cs., Liverpool, H. Kohnstamm & Co.

BRONZE POWDER — 21 cs., Bremen, Baer Bros.; 14 cs., Bremen, Order.

CAMPHOR—158 bbl., Hamburg, Order; 260 cs. crude, Yokohama, Order; 48 cs., Yokohama, N. G. Polson & Co.

CARBON—441 bg. decolorizing, Rotterdam, L. A. Salomon & Bros.

CHALK—125 csk., Bristol, H. J. Baker & Bro.; 200 bg., Antwerp, National City Bank; 200 bg., Antwerp, Brown Bros. & Co.; 500 bg., Antwerp, American Express Co.

CHEMICALS—38 cs., Trieste, Happel & McAvoy; 53 bbl., Hamburg, American Shipping Co.; 6 cs., Hamburg, Lehn & Fink; 3 cs. Hamburg, National American Bank; 48 csk. and 7 cs., Hamburg, Pfaltz & Bauer; 83 pkg., Hamburg, Order; 152 cs., Hamburg, Order; 38 cs., Hamburg, Jungmann & Co.; 100 cs., Havre, Order; 250 bg., Rotterdam, P. Uhlich & Co.; 640 dr., Hamburg, A. Klipstein & Co.

CHINA CLAY—267 bg., Bristol, C. T. Wilson Co.; 324 bg., Bristol, National City Bank; 300 tons, Bristol, Moore & Munger.

COAL-TAR DISTILLATE—3 dr., Liverpool, Order.

COLORS — 16 csk., Havre, Reichard-Coulston, Inc.; 1 csk. aniline, Havre, Order; 21 csk. do., Havre, Sandoz Chemical Works; 14 csk. do., Havre, Ciba Co.; 2 csk. do., Havre, Carbic Color & Chem. Co.; 5 cs., Havre, Drakenfeld & Co.; 4 csk. aniline, Havre, Irving Bank-Col. Trust Co.; 33 csk. earth, Hamburg, Reliance Paint Co.; 17 csk. do., Hamburg, Reichard-Coulston & Co.; 7 pkg., Southampton, Am. Express Co.; 10 csk. aniline, Hamburg, I. M. Huber; 17 cs., Hamburg, M. Grumbacher; 15 csk. aniline, Havre, Order; 6 csk. aniline, Havre, W. Sykes & Co.; 9 csk. aniline, Antwerp, Geigy Co.; 4 csk. aniline, Rotterdam, H. A. Metz & Co.; 24 pkg. do., Rotterdam, Kuttroff, Pickhardt & Co.; 34 csk. do., Rotterdam, Grasselli Dyestuff Corp.; 6 pkg. aniline, Hamburg, Franklin Import & Export Co.; 6 pkg. do., Hamburg, H. A. Metz & Co.; 2 cs. do., Hamburg, Order.

COPPER OXIDE—50 dr., Hamburg, Lo Qurto & Funk.

CUTCH—100 bbl., Liverpool, Order.

DIVI-DIVI—917 bg., Pampatar, Eggers & Heinlein; 750 bg., Pampatar, R. Desvernine; 833 bg., Maracaibo, R. Desvernine.

EPSOM SALT — 107 bbl., Hamburg, Roessler & Hasslacher Chemical Co.; 340 bg., Hamburg, Order.

FULLERS EARTH—250 bg., Bristol, L. A. Salomon & Bros., 300 bg., London, L. A. Salomon & Bros.

GLYCERINE—100 dr. crude, Hamburg, Order; 30 dr. crude, Antwerp, Order.

GLUE — 365 bg. bone, Hamburg, S. Isaacs & Co.

GUMS—25 cs. tragacanth, Southampton, Order; 200 bg. copal, Antwerp, A. Klipstein & Co.; 601 bg. do., Antwerp, Equitable Trust Co.; 100 cs. damar, Batavia, Bank of the Manhattan Co.; 300 cs. damar, Batavia, W. Schall & Co.; 100 cs. do., Batavia, American Exchange National Bank; 700 cs. do., Batavia, Order; 100 cs. do., Padang, Catz American Corp.; 300 cs. do., Padang, W. Schall & Co.; 353 bg. copal, Macassar, L. C. Gillespie & Sons; 598 bg. do., Macassar, Kidder, Peabody & Co.; 589 bg. do., Macassar, Equitable Trust Co.; 286 cs. do., Macassar, Innes & Co.; 125 pkg. do., Macassar, Order.

Opportunities in the Foreign Trade

Parties interested in any of the following opportunities may obtain all available information from the Bureau of Foreign and Domestic Commerce at Washington or from any district office of the bureau. The number placed after the opportunity must be given for the purpose of identification.

ACID, ACETIC, free of copper. Soerabaya, Java. Purchase.—11,509.

BLUE, CHINESE. Karachi, India. Purchase.—11,552.

CHEMICALS, for soap making. Copenhagen, Denmark. Agency.—11,514.

PAINTS, dry colors and varnishes. Bagdad, Turkey. Purchase.—11,525.

ROSIN. Bahia, Brazil. Agency.—11,512.

SODA ASH. Rotterdam, Netherlands. Purchase and agency.—11,516.

SODA, BICHROMATE, 25 to 50 tons, best quality. Malmo, Sweden. Purchase.—11,546.

SODA, CAUSTIC. Bahia, Brazil. Agency.—11,512.

OIL CAKE, Krakow, Poland. Purchase.—11,503.

TANNING EXTRACTS. Saloniki, Greece. Agency.—11,538.

INFUSORIAL EARTH—9,317 bg., Mostaganem, Order.

IRON OXIDE—2 csk. Hamburg, Meteor Products Co.; 35 csk., Bristol, Reichard-Coulston, Inc.; 48 csk., Bristol, Order; 40 csk., Liverpool, Reichard-Coulston, Inc.; 189 bbl., Malaga, Reichard-Coulston, Inc.; 10 bbl., Malaga, A. E. Rittwagen, Inc.

LITHOPONE — 100 csk., Rotterdam, Brown & Roese.

MANGANESE METAL—20 dr., Liverpool, Order.

MANGANESE ORE—76,125 kilos, Rotteradm, Iron & Ore Corp. of America.

MAGNESIUM CARBONATE — 21 bbl., Hamburg, Roessler & Hasslacher Chemical Co.

MAGNESIUM CHLORIDE — 548 dr., Hamburg, Innis, Speiden & Co.

MAGNESITE — 250 bg. and 100 bbl., Rotterdam, Innis, Speiden & Co.

MYROBALANS — 3,043 pkts., Calcutta, Order.

OILS—China Wood—300 csk. Hamburg, Anglo-South American Bank. **Coconut**—1,175 tons (in bulk), Manila, Order. **Linseed**—126 dr., Rotterdam, Order. **Olive foots** (sulphur oil)—100 bbl., Patras, Order; 300 bbl., Naples, National City Bank; 200 bbl., Messina, Leghorn Trading Co.; 100 bbl., Leghorn, Order. **Palm**—537 csk., Hamburg, Order; 140 csk., Hamburg, Order; 100 csk., Liverpool, Order; 30 bbl., Liverpool, Order. **Peanut**—5 bbl., Rotterdam, Lamont, Corliss & Co. **Rapeseed**—75 bbl., Liverpool, Order. **Seal**—294 tons (in bulk), St. Johns, Bowring & Co.

OIL SEEDS—Castor Beans—26 bg., Port de Paix, Huttlinger & Struller; 16 bg., Port au Prince, S. L. Brinley.

POTASSIUM SALTS—2,000 csk. chlorate, Hamburg, Irving Bank-Col. Trust Co.; 250 csk. alum, Hamburg, Mechanics & Metals National Bank; 150 cs. bromide, Hamburg, National Bank of Commerce; 347 dr. caustic, Hamburg, A. Klipstein & Co.; 34 bbl. prussiate, Hamburg, Order; 3,250 bg. muriate, Bremen, Potash Imp. Corp. of Am.; 50 cs. bromide, Bremen, Order; 2,001 bg. sulphate, 2,000 bg. muriate, 134,825 kilos do., 1 lot (in bulk) manure salt, Antwerp, Societe Comm. des Potasses d'Alsace; 5,000 bg. muriate, Bremen, Potash Importing Corp. of Am.; 3,334 bg. sulphate, Bremen, Potash Importing Corp. of Am.; 75 dr. caustic, Hamburg, Parsons & Petit; 5 dr. chlorate, Antwerp, C. Hardy, Inc.; 1 cs. cyanide, Antwerp, Order.

PUMICE — 684 bg powdered, Canneto Lipari, C. B. Chrystal Co.; 3,195 bg. lump, Canneto Lipari, Order.

PYRIDINE — 11 dr., Hamburg, R. W. Greeff & Co.; 6 dr., Hamburg, Order.

QUEBRACHO—2,040 bg. extract, Buenos Aires, Order.

ROCHELLE SALTS—20 cs., Hamburg, A. J. Marcus; 38 csk., Rotterdam, Seaboard National Bank.

SAL AMMONIAC — 69 bbl., Hamburg, Roessler & Hasslacher Chemical Co.; 34 bbl. and 25 csk., Hamburg, Order; 250 cs. salts Hamburg, Order.

SHELLAC—152 bg., Calcutta, Marx & Rawolle; 200 bg., Calcutta, MacLac Co.; 250 bg., Calcutta, First National Bank, Boston; 100 cs., Calcutta, Lee Higginson & Co.; 112 cs. and 250 bg., Calcutta, Brown Bros. & Co.; 2,840 pkg., Calcutta, Order.

SILICIOUS EARTH—406 bg., Hamburg, Irving Bank-Col. Trust Co.

SILVER SULPHIDE — 93 cs., Antofagasta, Watson, Geach & Co.

SODIUM SALTS — 100 bg. silicate, Venice, W. Wolf & Co.; 100 cs. bromide, Hamburg, Norvell Chemical Co.; 550 cs. cyanide, Hamburg, Roessler & Hasslacher Chemical Co.; 154 dr. sulphide, Hamburg, C. S. Grant & Co., 19 cs. salts, Hamburg, Order; 140 csk. fluoride, Hamburg, National City Bank; 67 csk. phosphate, Antwerp, Brown Bros. & Co.; 5,541 bg. nitrate, Mejillones, A. Gibbs & Co.; 46 csk. prussiate, Liverpool, C. Tennant Sons & Co.; 40 cs. bromide, Hamburg, Irving Bank-Col Trust Co.; 133 dr. hyposulphite, Rotterdam, Tubize Art Silk Co. of Am.; 5,176 bg. nitrate, Antofagasta, W. R. Grace & Co.; 8,811 bg. nitrate, Iquique, W. R. Grace & Co.

STARCH — 250 bg. potato, Rotterdam, Stein, Hall & Co.

TALC — 200 bg., Genoa, C. Mathieu; 1,300 bg., Genoa, Italian Discount & Trust Co.; 200 bg., Genoa, Kountze Bros.; 1,000 bg., Genoa, Coty, Inc.

TARTAR—260 bg. Oran, C. Pfizer & Co.; 323 bg., Oran, Tartar Chemical Works; 584 bg., Buenos Aires, C. Pfizer & Co.; 695 bg., Buenos Aires, Royal Baking Powder Co.; 270 bg., Marseilles, Harshaw, Fuller & Goodwin; 499 bg., Alicante, Royal Baking Powder Co.; 28 csk., Naples, Tartar Chemical Co.

ULTRAMARINE BLUE—2 cs., Rotterdam, Heller & Merz.

UMBER—990 bg. burnt, Larnaca, J. Lee Smith & Co.; 2,333 bg., Larnaca, Reichard-Coulston, Inc.

VALONEA—1,723 bg., Constantinople, J. A. Barkey & Co.

VERMILION—3 csk., London, Powell Co.

VANADIUM—6,400 bg., Callao, Vanadium Corp. of Am.

WAXES—40 bg. bleached montan, Hamburg, Coal & Iron National Bank; 50 cs. vegetable, Kobe, M. D. Levy & Co.; 24 bg. beeswax, Alexandria, Order; 18 bg. beeswax, Santo Domingo, W. R. Grace & Co.; 63 bg. beeswax, Talcahuano, W. R. Grace & Co.; 800 bg. paraffine, London, Order; 630 bg. paraffine, Marseilles, Order.

WHITING—500 bg., Antwerp, Reichard-Coulston, Inc.

WOOL GREASE — 100 bbl., Bremen, Bankers Trust Co.; 70 bbl., Bremen, Order; 85 csk., Bremen, Pfaltz & Bauer.

ZINC SULPHIDE—2 csk., London, O. A. Sykes.

Current Prices in the New York Market

For Chemicals, Oils and Allied Products

THESE prices are for the spot market in New York City, but a special effort has been made to report American manufacturers' quotations whenever available. In many cases these are for material f.o.b. works or on a contract basis and these prices are so designated. Quotations on imported stocks are reported when they are of sufficient importance to have a material effect on the market. Prices quoted in these columns apply to large quantities in original packages.

General Chemicals

Acetone, drums, wks.	lb.	$0.16 –	$0.16½
Acetic anhydride, 85 %, dr.	lb.	.34 –	.36
Acid, acetic, 28%, bbl. 100	lb.	3.12 –	3.37
Acetic, 56%, bbl. 100	lb.	5.85 –	6.10
Acetic, 80%, bbl. 100	lb.	8.19 –	8.44
Glacial, 99½%, bbl. 100	lb.	11.01 –	11.51
Boric, bbl.	lb.	.09 –	.09½
Citric, kegs.	lb.	.45½–	.47
Formic, 85%	lb.	.12½–	.13
Gallic, tech.	lb.	.45½–	.47
Hydrofluoric, 52%, carboys	lb.	.11 –	.12
Lactic, 44%, tech., light, bbl.	lb.	.12½–	.13
22% tech., light, bbl.	lb.	.06 –	.06½
Muriatic, 18° tanks 100	lb.	.80 –	.85
Muriatic, 20°, tanks 100	lb.	.95 –	1.00
Nitric, 36°, carboys	lb.	.04 –	.04½
Nitric, 42°, carboys	lb.	.04½–	.05¼
Oleum, 20%, tanks	ton	16.00 –	17.00
Oxalic, crystals, bbl.	lb.	.09½–	.09¾
Phosphoric, 50% carboys	lb.	.07 –	.08
Pyrogallic, resublimed	lb.	1.55 –	1.60
Sulphuric, 60°, tanks	ton	8.00 –	9.00
Sulphuric, 60°, drums	ton	12.00 –	13.00
Sulphuric, 66°, tanks	ton	13.00 –	14.00
Sulphuric, 66°, drums	ton	17.00 –	18.00
Tannic, U.S.P., bbl.	lb.	.65 –	.70
Tannic, tech., bbl.	lb.	.45 –	.50
Tartaric, imp., powd., bbl.	lb.	.26½–	.28
Tartaric, domestic, bbl.	lb.	.29 –	.30
Tungstic, per lb.	lb.	1.20 –	1.25
Alcohol, butyl, drums, f.o.b. works	lb.	.27 –	.30
Alcohol ethyl (Cologne spirit), bbl.	gal.	4.83 –	.....
Ethyl, 190 p'f. U.S.P., bbl.	gal.	4.81 –	.....
Alcohol, methyl (see Methanol)			
Alcohol, denatured, 190 proof			
No. 1, special bbl.	gal.	.53 –	.....
No. 1, 190 proof, special, dr.	gal.	.47 –	.....
No. 1, 188 proof, bbl.	gal.	.56 –	.....
No. 1, 188 proof, dr.	gal.	.50 –	.....
No. 5, 188 proof, bbl.	gal.	.52 –	.....
No. 5, 188 proof, dr.	gal.	.46 –	.....
Alum, ammonia, lump, bbl.	lb.	.03½–	.04
Potash, lump, bbl.	lb.	.02½–	.03½
Chrome, lump, potash, bbl.	lb.	.05½–	.06
Aluminum sulphate, com., bags 100	lb.	1.35 –	1.40
Iron free bags.	lb.	2.35 –	2.45
Aqua ammonia, 26°, drums	lb.	.06½–	.06¾
Ammonia, anhydrous, cyl.	lb.	.28 –	.30
Ammonium carbonate, powd. tech., casks	lb.	.12½–	.12¾
Ammonium nitrate, tech., casks	lb.	.09 –	.10
Amyl acetate tech., drums	gal.	2.50 –	2.60
Antimony oxide, white, bbl.	lb.	.10½–	.11½
Arsenic, white, powd., bbl.	lb.	.07½–	.07½
Arsenic, red, powd., kegs	lb.	.14½–	.15½
Barium carbonate, bbl.	ton	57.00 –	59.00
Barium chloride, bbl.	ton	73.00 –	74.00
Barium dioxide, 88%, drums	lb.	.17½–	.18
Barium nitrate, casks	lb.	.07½–	.08
Blanc fixe, dry, bbl.	lb.	.03½–	.04
Bleaching powder, f.o.b. wks., drums 100	lb.	1.90 –	.....
Spot N. Y. drums 100	lb.	2.20 –	2.25
Borax, bbl.	lb.	.05 –	.05½
Bromine, cases	lb.	.34 –	.38
Calcium acetate, bags 100	lb.	3.00 –	3.05
Calcium arsenate, dr.	lb.	.08 –	.09
Calcium carbide, drums	lb.	.05 –	.05½
Calcium chloride, fused, dr. wks.	ton	21.00 –	.....
Gran. drums works	ton	27.00 –	.....
Calcium phosphate, mono, bbl.	lb.	.06½–	.07½
Camphor, Jap. cases	lb.	.68 –	.69
Carbon bisulphide, drums	lb.	.06 –	.06½
Carbon tetrachloride, drums	lb.	.06½–	.07
Chalk, precip.—domestic, light, bbl.	lb.	.04½–	.04½
Domestic, heavy, bbl.	lb.	.03½–	.04
Imported, light, bbl.	lb.	.04½–	.05
Chlorine, liquid, tanks, wks.	lb.	.04½–	.....
Contract, tanks, wks.	lb.	.04½–	.....
Cylinders, 100 lb., wks.	lb.	.05½–	.07½
Chloroform, tech., drums	lb.	.30 –	.32
Cobalt, oxide, bbl.	lb.	2.10 –	2.25
Copperas, bulk, f.o.b. wks.	ton	16.00 –	17.00
Copper carbonate, bbl.	lb.	.17 –	.17½
Copper cyanide, drums	lb.	.45 –	.46
Copper oxide, kegs	lb.	.16½–	.17
Coppersulphate, dom., bbl. 100	lb.	4.60 –	4.75
Imp. bbl. 100	lb.	4.40 –	4.45
Cream of tartar, bbl.	lb.	.20½–	.21
Epsom salt, dom., tech., bbl. 100	lb.	1.75 –	2.00
Epsom salt, imp., tech., bags 100	lb.	1.35 –	1.37½
Epsom salt, U.S.P., dom., bbl. 100	lb.	2.10 –	2.35
Ether, U.S.P., dr concent'd.	lb.	.13 –	.14
Ethyl acetate, 85%, drums	gal.	.92 –	.95
Ethyl acetate, 99%, dr.	gal.	$1.08 –	$1.10
Formaldehyde, 40%, bbl.	lb.	.08½–	.09
Fullers earth—f.o.b. mines	ton	7.50 –	18.00
Furfural, works, bbl.	lb.	.25 –	.....
Fusel oil, ref., drums	gal.	3.00 –	3.50
Fusel oil, crude, drums	gal.	2.00 –	2.25
Glaubers salt, wks., bags 100	lb.	1.20 –	1.40
Glaubers salt, imp., bags 100	lb.	.90 –	.92
Glycerine, c. p., drums extra	lb.	.19 –	.19½
Glycerine, dynamite, drums	lb.	.18½–	.18¾
Glycerine, crude 80%, loose	lb.	.12½–	.12½
Hexamethylene, drums	lb.	.65 –	.70
Lead:			
White basic carbonate, dry, casks	lb.	.10 –	.....
White, basic sulphate, casks	lb.	.09½–	.....
White, in oil, kegs	lb.	.11½–	.11¾
Red, dry, casks	lb.	.11 –	.....
Red, in oil, kegs	lb.	.13½–	.13½
Lead acetate, white crys., bbl.	lb.	.14½–	.....
Brown, broken, casks	lb.	.13½–	.....
Lead arsenate, powd., bbl.	lb.	.16 –	.18
Lime-Hydrated, b.g., wks.	ton	10.50 –	12.50
Bbl., wks.	ton	18.00 –	19.00
Lime, Lump, bbl. 280	lb.	3.63 –	3.65
Litharge, comm., casks	lb.	.10½–	.....
Lithopone, bags	lb.	.06½–	.06¾
Magnesium carb., tech., bags	lb.	.08½–	.08½
Methanol, 95%, bbl.	gal.	.74 –	.76
Methanol, 97%, bbl.	gal.	.76 –	.78
Methanol, pure, tanks	gal.	.75 –	.....
drums	gal.	.78 –	.80
bbl.	gal.	.83 –	.85
Methyl-acetone, t'ks	gal.	.70 –	.....
Nickel salt, double, bbl.	lb.	.09 –	.10½
Nickel salts, single, bbl.	lb.	.10 –	.11
Orange mineral, csk.	lb.	.14 –	.14½
Phosgene		.60 –	.75
Phosphorus, red, cases	lb.	.70 –	.75
Phosphorus, yellow, cases	lb.	.37½–	.40
Potassium bichromate, casks	lb.	.08½–	.08¾
Potassium bromide, gran., bbl.	lb.	.25 –	.38
Potassium carbonate, 80-85%, calcined, casks	lb.	.05 –	.05½
Potassium chlorate, powd.	lb.	.06½–	.08½
Potassium cyanide, drums	lb.	.47 –	.52
Potassium, first sorts, cask	lb.	.08½–	.08½
Potassium hydroxide (Caustic potash) drums	lb.	.06½–	.....
Potassium iodide, cases	lb.	3.65 –	3.75
Potassium nitrate, bbl.	lb.	.06 –	.07½
Potassium permanganate, drums	lb.	.13 –	.13½
Potassium prussiate, red, casks	lb.	.37 –	.38
Potassium prussiate, yellow, casks	lb.	.17 –	.17½
Salammoniac, white, gran., casks, imported	lb.	.06 –	.06½
Salammoniac, white, gran., bbl., domestic	lb.	.07½–	.08
Gray, gran., casks	lb.	.08 –	.09
Salsoda, bbl. 100	lb.	1.20 –	1.40
Salt cake (bulk) works	ton	17.00 –	18.00
Soda ash, light, 58% flat, bulk, contract 100	lb.	1.25 –	.....
bags, contract 100	lb.	1.38 –	.....
Soda ash, dense, bulk, contract, basis 58% 100	lb.	1.35 –	.....
bags, contract 100	lb.	1.45 –	.....
Soda, caustic, 76%, solid, drums contract 100	lb.	3.10 –	.....
Soda, caustic, ground and flake, contracts, dr. 100	lb.	3.50 –	3.85
Soda, caustic, solid, 76% f.a.s. N. Y. 100	lb.	2.90 –	3.05
Sodium acetate, works, bbl.	lb.	.04½–	.05
Sodium bicarbonate, bulk 100	lb.	1.75 –	.....
330-lb. bbl. 100	lb.	2.00 –	.....
Sodium bichromate, casks	lb.	.06½–	.07
Sodium bisulphate (niter cake)	ton	6.00 –	7.00
Sodium bisulphite, powd., U.S.P., bbl.	lb.	.04½–	.04½
Sodium chlorate, kegs	lb.	.06½–	.07
Sodium chloride long	ton	12.00 –	13.00
Sodium cyanide, cases	lb.	.19 –	.22
Sodium fluoride, bbl.	lb.	$0.08½–	$0.09
Sodium hyposulphite, bbl.	lb.	.02½–	.02½
Sodium nitrate, casks	lb.	.09 –	.09½
Sodium peroxide, powd., cases	lb.	.23 –	.27
Sodium phosphate, dibasic, bbl.	lb.	.03½–	.03½
Sodium prussiate, yel. bbl.	lb.	.09½–	.10
Sodium salicylic, drums	lb.	.38 –	.40
Sodium silicate (40°, drums) 100	lb.	.75 –	1.15
Sodium silicate (60°, drums) 100	lb.	1.75 –	2.00
Sodium sulphide, fused, 60-62% drums	lb.	.02½–	.03½
Sodium sulphite, crys., bbl.	lb.	.02 –	.02½
Strontium nitrate, powd., bbl	lb.	.09½–	.10
Sulphur chloride, yel drums	lb.	.04½–	.05
Sulphur, crude	ton	18.00 –	20.00
At mine, bulk	ton	16.00 –	18.00
Sulphur, flour, bag 100	lb.	2.25 –	2.35
Sulphur, roll, bag 100	lb.	2.00 –	2.10
Sulphur dioxide, liquid, cyl.	lb.	.08 –	.08½
Tin bichloride, bbl.	lb.	.14½–	.....
Tin oxide, bbl.	lb.	.55 –	.....
Tin crystals, bbl.	lb.	.37 –	.....
Zinc carbonate, bags	lb.	.12 –	.14
Zinc chloride, gran, bbl.	lb.	.06 –	.07½
Zinc cyanide, drums	lb.	.36½–	.37
Zinc dust, bbl.	lb.	.08 –	.08½
Zinc oxide, lead free, bag	lb.	.07½–	.....
5% lead sulphate bags	lb.	.06½–	.....
10 to 35% lead sulphate, bags	lb.	.06½–	.....
French, red seal, bags	lb.	.09½–	.....
French, green seal, bags	lb.	.10½–	.....
French, white seal, bbl.	lb.	.11½–	.....
Zinc sulphate, bbl. 100	lb.	3.00 –	3.25

Coal-Tar Products

Alpha-naphthol, crude, bbl.	lb.	$0.60 –	$0.65
Alpha-naphthol, ref., bbl.	lb.	.65 –	.75
Alpha-naphthylamine, bbl.	lb.	.35 –	.36
Aniline oil, drums	lb.	.16 –	.16½
Aniline salt, bbl.	lb.	.20 –	.22
Anthracene, 80%, drums	lb.	.70 –	.75
Anthraquinone, 25%, paste, drums	lb.	.75 –	.80
Benzaldehyde U.S.P., carboys	lb.	1.50 –	.....
f.f.c. drums	lb.	1.60 –	.....
tech, drums	lb.	.68 –	.72
Benzene, pure, water-white, tanks, works	gal.	.25 –	.....
Benzene, 90%, tanks, works	gal.	.23 –	.....
Benzidine base, bbl.	lb.	.80 –	.82
Benzidine sulphate, bbl.	lb.	.70 –	.72
Benzoic acid, U.S.P., kegs	lb.	.75 –	.85
Benzoate of soda, U.S.P., bbl.	lb.	.65 –	.70
Benzyl chloride, 95-97%, ref. carboys	lb.	.35 –	.....
Benzyl chloride, tech., drums	lb.	.25 –	.....
Beta-naphthol, tech., bbl.	lb.	.24 –	.25
Beta-naphthylamine, tech.	lb.	.65 –	.70
Cresol, U.S.P., drums	lb.	.23 –	.26
Ortho-cresol, drums	lb.	.28 –	.32
Cresylic acid, 97%, works drums	gal.	.63 –	.65
95-97%, drums, works	gal.	.58 –	.60
Dichlorbenzene, drums	lb.	.07 –	.08
Diethylaniline, drums	lb.	.59 –	.62
Dimethylaniline, drums	lb.	.35 –	.36
Dinitrobenzene, bbl.	lb.	.15 –	.17
Dinitrochlorbenzene, bbl.	lb.	.21 –	.22
Dinitronaphthalen, bbl.	lb.	.30 –	.32
Dinitrophenol, bbl.	lb.	.35 –	.40
Dinitrotoluen, bbl.	lb.	.18 –	.20
Dip oil, 25%, drums	gal.	.26 –	.28
Diphenylamine, bbl.	lb.	.48 –	.50
H-acid, bbl.	lb.	.72 –	.75
Meta-phenylenediamine, bbl.	lb.	.95 –	1.00
Michlers ketone, bbl.	lb.	3.00 –	3.25
Monochlorbenzene, drums	lb.	.08 –	.10
Monoethylaniline, drums	lb.	1.20 –	1.30½
Naphthalene, flake, bbl.	lb.	.04½–	.05
Naphthalene, balls, bbl.	lb.	.05 –	.05½
Naphthionate of soda, bbl.	lb.	.60 –	.65
Naphthionic acid, crude, bbl.	lb.	.60 –	.62½
Nitrobenzene, drums	lb.	.09 –	.09
Nitro-naphthalene, bbl.	lb.	.25 –	.27
Nitro-toluene, drums	lb.	.13½–	.14
N-W acid, bbl.	lb.	1.00 –	1.05
Ortho-amidophenol, kegs	lb.	2.40 –	2.50
Ortho-dichlorbenzene, drums	lb.	.12 –	.13
Ortho-nitrophenol, bbl.	lb.	.95 –	1.00
Ortho-nitroluene, drums	lb.	.11 –	.12
Ortho-toluidine, bbl.	lb.	.14 –	.16
Para-aminophenol, base, kegs	lb.	1.20 –	1.25
Para-aminophenol, HCl, kegs	lb.	1.30 –	1.40
Para-dichlorbenzene, bbl.	lb.	.17 –	.20
Para-nitraniline, bbl.	lb.	.68 –	.70
Para-nitrotoluene, bbl.	lb.	.50 –	.55
Para-phenylendiamine, bbl.	lb.	1.35 –	1.45
Para-toluidine, bbl.	lb.	.75 –	.80
Phthalic anhydride, bbl.	lb.	.25 –	.30
Phenol, U.S.P., dr.	lb.	.24 –	.26
Picric acid, bbl.	lb.	.20 –	.22
Pitch, tanks, works	ton	27.00 –	30.00
Pyridine, imp., drums	gal.	4.35 –	4.50
Resorcinol, tech., kegs	lb.	1.30 –	1.40

Resorcinol, pure, kegs	lb.	$2.00	$2.25
R-salt, bbl	lb.	.50	.55
Salicylic acid, tech., bbl	lb.	.32	.33
Salicylic acid, U.S.P., bbl	lb.	.35	.....
Solvent naphtha, water-white, tanks	gal.	.25	.....
Crude, tanks	gal.	.22	.....
Sulphanilic acid, crude, bbl.	lb.	.16	.18
Toluidine, bbl	lb.	1.00	1.05
Toluidine, mixed, kegs	lb.	.30	.35
Toluene, tank cars, works	gal.	.26	.....
Toluene, drums, works	gal.	.31	.....
Xylidine, drums	lb.	.40	.42
Xylene, 5 deg.-tanks	gal.	.38	.40
Xylene, com., tanks	gal.	.25	.27

Naval Stores

Rosin B-D, bbl. 280	lb.	$6.00	$6.10
Rosin E-I, bbl. 280	lb.	6.20	6.30
Rosin K-N, bbl. 280	lb.	6.30	6.40
Rosin W.G.-W.W., bbl. 280	lb.	7.60	8.00
Wood rosin, bbl. 280	lb.	5.40	5.50
Turpentine, spirits of, bbl	gal.	.89	.....
Wood, steam dist., bbl	gal.	.75	.....
Wood, dest. dist., bbl	gal.	.56	.....
Pine tar pitch, bbl. 200	lb.	5.50	.....
Tar, kiln burned, bbl. 500	lb.	10.50	.....
Retort tar, bbl. 500	lb.	10.50	.....
Rosin oil, first run, bbl	gal.	.40	.....
Rosin oil, second run, bbl	gal.	.42	.....
Rosin oil, third run, bbl	gal.	.46	.....
Pine oil, steam dist	gal.	.60	.....
Pine tar oil, com'l	gal.	.30	.....

Animal Oils and Fats

Degras, bbl	lb.	$0.03½	$0.05½
Grease, yellow, loose	lb.	.07½	.....
Lard oil, Extra No. 1, bbl	gal.	.84	.85
Lard compound, bbl	lb.	.13½	.14
Neatsfootoil, 20 deg. bbl	gal.	1.30	.....
No. 1, bbl	gal.	.84	.86
Oleo Stearine		.13	.....
Oleo oil, No. 1, bbl	lb.	.17½	.....
Red oil, distilled, d.p. bbl	lb.	.09½	.09¾
Saponified, bbl	lb.	.09½	.09¾
Tallow, extra, loose works	lb.	.08½	.....
Tallow oil, acidless, bbl	gal.	.84	.86

Vegetable Oils

Castor oil, No. 3, bbl	lb.	$0.16½	.....
Castor oil, No. 1, bbl	lb.	.17	.....
Chinawood oil, bbl	lb.	.15½	$0.16
Coconut oil, Ceylon, bbl	lb.	.10	.10½
Ceylon, tanks, N. Y	lb.	.09½	.09¾
Coconut oil, Cochin, bbl	lb.	.10½	.10¾
Corn oil, crude, bbl	lb.	.11	.11¼
Crude, tanks, (f.o.b. mill)	lb.	.09	.09¼
Cottonseed oil, crude (f.o.b. mill), tanks	lb.	.08½	.08¾
Summer yellow, bbl	lb.	.11½	.11¾
Winter yellow, bbl	lb.	.13½	.14
Linseed oil, raw, car lots, bbl.	gal.	1.00	1.02
Raw, tank cars (dom.)	gal.	.94	.....
Boiled, cars, bbl. (dom.)	gal.	1.02	1.04
Olive oil, denatured, bbl	gal.	1.18	1.22
Sulphur, (foots) bbl	lb.	.09¼	.09½
Palm, Lagos, casks	lb.	.08¼	.08¾
Niger, casks	lb.	.07½	.08
Palm kernel, bbl	lb.	.09½	.....
Peanut oil, crude, tanks (mill)	lb.	.12½	.....
Peanut oil, refined, bbl	lb.	.16	.16½
Perilla, bbl	lb.	.14	.14½
Rapeseed oil, refined, bbl	gal.	.86	.88
Sesame, bbl	lb.	.13½	.13¾
Soya bean (Manchurian), bbl	lb.	.12	.12½
Tank, f.o.b. Pacific Coast	lb.	.10½	.10¾
Tank, (f.o.b. N. Y.)	lb.	.11	.11¼

Fish Oils

Cod, Newfoundland, bbl	gal.	$0.63	$0.65
Menhaden, light pressed, bbl.	gal.	.64	.....
White bleached, bbl	gal.	.66	.....
Blown, bbl	gal.	.68	.....
Crude, tanks (f.o.b. factory)	gal.	.50	.55
Whale No. 1 crude, tanks, coast	lb.	.....	.....
Winter, natural, bbl	gal.	.75	.76
Winter, bleached, bbl	gal.	.78	.79

Oil Cake and Meal

Coconut cake, bags	ton	$33.00	$34.00
Cottonseed meal, f.o.b. mills	ton	44.00	45.00
Linseed cake, bags	ton	45.50	.....
Linseed meal, bags, spot	ton	47.00	47.50

Dye & Tanning Materials

Albumen, blood, bbl	lb.	$0.50	$0.55
Albumen, egg, tech, kegs	lb.	.95	.97
Cochineal, bags	lb.	.33	.35
Cutch, Borneo, bales	lb.	.04½	.04¾
Cutch, Rangoon, bales	lb.	.13½	.14¼
Dextrine, corn, bags 100	lb.	4.32	4.75
Dextrine, gum, bags 100	lb.	4.82	5.09
Divi-divi, bags	ton	41.00	42.00
Fustic, sticks	ton	30.00	35.00
Fustic, chips, bags	lb.	.04	.05
Gambier com., bags	lb.	.13	.13½
Logwood, sticks	ton	25.00	26.00
Logwood, chips, bags	lb.	.02½	.03
Sumac, leaves, Sicily, bags	ton	140.00	145.00
Sumac, ground, bags	ton	135.00	140.00
Sumac, domestic, bags	ton	50.00	55.00
Starch, corn, bags 100	lb.	3.87	4.08
Tapioca flour, bags	lb.	.04½	.06

Extracts

Archil, conc., bbl	lb.	$0.16	$0.19
Chestnut, 25% tannin, tanks	lb.	.01½	.02½
Divi-divi, 25% tannin, bbl	lb.	.05	.05
Fustic, crystals, bbl	lb.	.20	.22
Fustic, liquid, 42°, bbl	lb.	.08	.09½
Gambier, liq., 25% tannin, bbl.	lb.	.11	.11
Hematine crys., bbl	lb.	.14	.18
Hemlock, 25% tannin, bbl	lb.	.03½	.04
Hypernic, solid, drums	lb.	.22	.24
Hypernic, liquid, 51°, bbl	lb.	.12	.13
Logwood, crys., bbl	lb.	.14	.15
Logwood, liq., 51°, bbl	lb.	.07½	.08½
Osage Orange, 51°, liquid, bbl.	lb.	.07	.08
Osage Orange, powder, bg	lb.	.14	.15
Quebracho, solid, 65% tannin, bbl	lb.	.04½	.04¾
Sumac, dom., 51°, bbl	lb.	.06¼	.06½

Dry Colors

Blacks–Carbongas, bags, f.o.b. works, contract	lb.	$0.09	$0.11
spot, cases	lb.	.12	.16
Lampblack, bbl	lb.	.12	.40
Mineral, bulk	ton	35.00	45.00
Blues–Bronze, bbl	lb.	.36	.38
Prussian, bbl	lb.	.36	.38
Ultramarine, bbl	lb.	.07	.35
Browns, Sienna, Ital., bbl	lb.	.05	.12
Sienna, Domestic, bbl	lb.	.03	.03½
Umber, Turkey, bbl	lb.	.04	.04½
Greens-Chrome, C.P.Light, bbl	lb.	.28	.30
Chrome, commercial, bbl	lb.	.10½	.11½
Paris, bulk	lb.	.24	.26
Reds, Carmine No. 40, tins	lb.	4.25	4.50
Iron oxide red, casks	lb.	.08	.12
Para toner, kegs	lb.	.95	1.00
Vermilion, English, bbl	lb.	1.30	1.35
Yellow, Chrome, C.P. bbls	lb.	.17	.17½
Ocher, French, casks	lb.	.02	.03

Waxes

Bayberry, bbl	lb.	$0.21	$0.21½
Beeswax, crude, Afr. bg	lb.	.26	.26½
Beeswax, refined, light, bags	lb.	.32	.34
Beeswax, pure white, cases	lb.	.40	.41
Candellila, bags	lb.	.23	.23½
Carnauba, No. 1, bags	lb.	.33	.35
No. 2, North Country, bags	lb.	.25	.26
No. 3, North Country, bags	lb.	.22½	.23
Japan, cases	lb.	.17	.17½
Montan, crude, bags	lb.	.06	.06¼
Paraffine, crude, match, 105-110 m.p., bbl	lb.	.06½	.06¾
Crude, scale 124-126 m.p. bags	lb.	.05½	.06
Ref., 118-120 m.p. bags	lb.	.06½	.06½
Ref., 123-125 m.p., bags	lb.	.06½	.06¾
Ref., 128-130 m.p., bags	lb.	.06¾	.07
Ref., 133-135 m.p., bags	lb.	.08	.08½
Ref., 135-137 m.p., bags	lb.	.10	.10½
Stearic acid, sgle. pressed, bags	lb.	.11	.11½
Double pressed, bags	lb.	.11½	.12
Triple pressed, bags	lb.	.12½	.13

Fertilizers

Acid phosphate, 16%, bulk, works	ton	$7.50	$7.75
Ammonium sulphate, bulk f.o.b. works 100	lb.	2.70	.....
Blood, dried, bulk	unit	4.10	4.15
Bone, raw, 3 and 50, ground.	ton	26.00	28.00
Fish crap, dom., dried, wks	unit	4.50	.....
Nitrate of soda, bags 100	lb.	2.50	.....
Tankage, high grade, f.o.b. Chicago	unit	2.60	3.00
Phosphate rock, f.o.b. mines Florida pebble, 68-72%	ton	3.25	3.70
Tennessee, 75%	ton	6.75	7.00
Potassium muriate, 80%, bags	ton	34.55	.....
Potassium sulphate, bags basis 90%	ton	45.85	.....
Double manure salt, bgs	ton	26.35	.....
Kainit, 14%, bgs	ton	10.25	.....

Crude Rubber

Para—Upriver fine	lb.	$0.28	.....
Upriver coarse	lb.	.21½	.....
Upriver caucho ball	lb.	.17	.....
Plantation—First latex crepe	lb.	.27½	.....
Ribbed smoked sheets	lb.	.27½	.....
Amber crepe No. 1	lb.	.27½	.....

Gums

Copal, Congo, amber, bags	lb.	$0.08	$0.10
East Indian, bold, bags	lb.	.13	.14
Manila, pale, bags	lb.	.18	.19
Pontinak, No. 1, bags	lb.	.19	.20
Damar, Batavia, cases	lb.	.23½	.24
Singapore, No. 1, cases	lb.	.26½	.27
Singapore, No. 2, cases	lb.	.18	.18½
Kauri, No. 1, cases	lb.	.58	.64
Ordinary chips, cases	lb.	.21	.22
Manjak, Barbados, bags	lb.	.06	.09

Shellac

Shellac, orange fine, bags	lb.	$0.63	$0.64
Orange superfine, bags	lb.	.65	.66
A. C. garnet, bags	lb.	.58	.60
Bleached, bonedry	lb.	.71	.72
Bleached, fresh	lb.	.60	.61
T. N., bags	lb.	.59	.60

Miscellaneous Materials

Asbestos, crude No. 1 f.o.b., Quebec sh. ton		$300.00	$400.00
Asbestos, shingle, f.o.b., Quebec sh. ton		50.00	60.00
Asbestos, cement, f.o.b., Quebec sh. ton		15.00	20.00
Barytes, grd., white, f.o.b. mills, bbl net ton		16.00	17.00
Barytes, grd., off-color, f.o.b., Balt net ton		13.00	14.00
Barytes, floated, f.o.b., St. Louis, bbl net ton		23.00	24.00
Barytes, crude f.o.b. mines, bulk net ton		8.00	9.00
Casein, bbl., tech lb		.10½	.12
China clay (kaolin) crude, No. 1, f.o.b. Ga net ton		7.00	8.00
Washed, f.o.b. Ga net ton		8.50	9.00
Powd., f.o.b. Ga net ton		14.00	20.00
Crude, f.o.b. Va net ton		6.00	8.00
Ground, f.o.b. Va net ton		13.00	19.00
Imp., lump, bulk net ton		15.00	20.00
Imp., powd net ton		45.00	50.00
Feldspar, No. 1 f.o.b. N.C. long ton		6.50	7.25
No. 2 f.o.b. N.C. long ton		4.50	5.00
No. 1 gr'd. N.C. long ton		15.32	21.00
No. 1 Canadian, f.o.b., mill, powd long ton		20.00	.....
Graphite, Ceylon, lump, first quality, bbl	lb.	.05½	.06
Ceylon, chip, bbl	lb.	.04½	.05
High grade amorphous crude	ton	15.00	35.00
Gum arabic, amber, sorts, bags	lb.	.11½	.12
Gum tragacanth, sorts, bags	lb.	.50	.55
No. 1, bags	lb.	1.20	.....
Kieselguhr, f.o.b. Cal	ton	40.00	42.00
F.o.b. N.Y	ton	50.00	55.00
Magnesite, calcined, f.o.b. Cal.	ton	35.00	45.00
Pumice stone, imp., casks	lb.	.03	.40
Dom., lump, bbl	lb.	.06	.08
Dom., ground, bbl	lb.	.03	.05
Silica, glass sand, f.o.b Ind	ton	2.00	2.25
Silica, sand blast, f.o.b. Ind	ton	2.25	3.50
Silica, amorphous, 200-mesh, f.o.b. Ill	ton	20.00	.....
Silica, glass sand, f.o.b. Ill	ton	2.00	2.50
Soapstone, coarse, f.o.b., Vt., bags	ton	7.50	8.00
Talc, 200 mesh, f.o.b., Vt., bags, extra	ton	10.50	.....
Talc, 200 mesh, f.o.b., Ga., bags	ton	9.50	10.00
Talc, 325 mesh, f.o.b. New York, grade A bags	ton	14.75	.....

Minerals Oils

Crude, at Wells

Pennsylvania	bbl.	$2.75	$3.00
Corning	bbl.	1.75	.....
Cabell	bbl.	1.45	.....
Somerset	bbl.	1.55	.....
Illinois	bbl.	1.62	.....
Indiana	bbl.	1.63	.....
Kansas and Okla. under 28 deg.	bbl.	.90	.....
California, 35 deg. and up	bbl.	1.40	.....

Gasoline, Etc.

Motor gasoline steel bbls	gal.	$0.18	.....
Naphtha, V. M. & P. deod, steel bbls	gal.	.17	.....
Kerosene, ref. tank wagon	gal.	.13	.....
Bulk, W.W. delivered, N.Y.	gal.	.07½	.07¾
Lubricating oils:			
Cylinder, Penn., filtered	gal.	.29	.32
Bloomless, 30@ 31 grav	gal.	.20	.21
Paraffin, pale 885 vis	gal.	.15½	.16½
Spindle, 200, pale	gal.	.21	.21½
Petrolatum, amber, bbls	lb.	.04	.04½
Paraffine wax (see waxes)			

Refractories

Bauxite brick, 56% Al_2O_3, f.o.b. Pittsburgh	1,000	$140	$145
Chrome brick, f.o.b. Eastern shipping points	ton	50	...
Chrome cement, 40-50% Cr_2O_3	ton	23	27
40-45% Cr_2O_3, sacks, f.o.b. Eastern shipping points	ton	23.00	
Fireclay brick, 1st. quality, 9-in. shapes, f.o.b. Ky. wks	1,000	42	45
2nd. quality, 9-in. shapes, f.o.b. wks	1,000	35	38
Magnesite brick, 9-in. straight (f.o.b. wks)	ton	65	68
9-in. arches, wedges and keys	ton	80	85
Scraps and splits	ton		85
Silica brick, 9-in. sizes, f.o.b. Chicago district	1,000	48	50
Silica brick, 9-in. sizes, f.o.b. Birmingham district	1,000	48	50
F.o.b. Mt. Union, Pa	1,000	38	39
Silicon carbide retract brick, 9-in.	1,000	1,180.00	

Ferro-Alloys

Ferrotitanium, 15-18% f.o.b. Niagara Falls, N. Y.	ton	$200.00	.....

Ferrochromium, per lb. of Cr, 1-2% C	lb.	$0.30 –	.....
4-6% C	lb.	.12½–	.....
Ferromanganese, 78-82% Mn, Atlantic seabd. duty paid	gr. ton	92.50 –	$95.00
Spiegeleisen, 19-21% Mn.	gr. ton	33.00 –	35.00
Ferromolybdenum, 50-60% Mo, per lb. Mo	lb.	2.00 –	2.25
Ferrosilicon, 10-12%	gr. ton	39.50 –	43.50
50%	gr. ton	72.00 –	75.00
Ferrotungsten, 70-80% per lb. of W	lb.	.88 –	.90
Ferro-uranium, 35-50%, of U, per lb. of U	lb.	4.50 –	.....
Ferrovanadium, 30-40%, per lb. of V	lb.	3.25 –	3.75

Ores and Semi-finished Products

Bauxite, dom. crushed, dried, f.o.b. shipping points	ton	$5.50 –	$8.75
Chrome ore, Calif. concentrates, 50% min. Cr_2O_3	ton	22.00 –	.....
C.i.f. Atlantic seaboard	ton	19.00 –	24.00
Coke, fdry., f.o.b. ovens	ton	4.00 –	4.50
Coke, furnace, f.o.b. ovens	ton	3.00 –	3.10
Fluorspar, gravel, f.o.b. mines, Illinois	ton	22.00 –	23.50
Ilmenite, 52% TiO_2 Va	lb.	.01½–	.....
Manganese ore, 50% Mn, c.i.f. Atlantic seaport	unit	.42 –	.46
Manganese ore, chemical (MnO_2)	ton	75.00 –	80.00
Molybdenite 85% MoS_2, per lb. Mo S_2, N. Y.	lb.	.70 –	.....
Monazite, per unit of ThO_2, c.i.f., Atl. seaport	lb.	.06 –	.08
Pyrites, Span., fines, c.i.f. Atl. seaport	unit	.11½ –	.12
Pyrites, Span., furnace size, c.i.f. Atl. seaport	unit	.12 –	.....
Pyrites, dom. fines, f.o.b. mines, Ga	unit	.12 –	.....
Rutile, 94@96% TiO_2	lb.	.12 –	.15
Tungsten, scheelite, 60% WO_3 and over	unit	9.00 –	.....
Tungsten, wolframite, white, 60% WO_3	unit	8.50 –	8.75
Uranium ore (carnotite) per lb. of U_3O_8	lb.	3.50 –	3.75
Uranium oxide, 96% per lb. U_3O_8	lb.	12.25 –	12.50
Vanadium pent oxide, 99%	lb.	12.50 –	14.00
Vanadium ore, per lb. V_2O_5	lb.	1.00 –	1.25
Zircon, 99%	lb.	.06 –	.07

Non-Ferrous Metals

Copper, electrolytic	lb.	$0.13¾–	$0.13½
Aluminum, 98 to 99%	lb.	.27 –	.28
Antimony, wholesale, Chinese and Japanese	lb.	.10½–	.11
Nickel, 99%	lb.	.27½–	.29
Monel metal, shot and blocks	lb.	.32	
Tin, 5-ton lots, Straits	lb.	.50¼	
Lead, New York, spot	lb.	.08	
Lead, E. St. Louis, spot	lb.	.08	
Zinc, spot, New York	lb.	.06525	
Zinc, spot, E. St. Louis	lb.	.06175	
Silver (commercial)	oz.	.69⅜	
Cadmium	lb.	.60	
Bismuth (500 lb. lots.)	lb.	1.85–1.90	
Cobalt	lb.	2.50–3.00	
Magnesium, ingots, 99%	lb.	.90–95	
Platinum, refined	oz.	120.00	
Iridium	oz.	260.00–270.00	
Palladium, refined	oz.	78.00–83.00	
Mercury	75 lb.	72.00–	
Tungsten powder	lb.	.95–1.00	

Finished Metal Products

	Warehouse Price Cents per Lb.
Copper sheets, hot rolled	20.62½
Copper bottoms	29.75
Copper rods	20.00
High brass rods	17.25
High brass rods	14.75
Low brass wire	19.50
Low brass rods	20.00
Brazed bronze tubing	24.75
Seamless copper tubing	22.75
Seamless high brass tubing	21.50

OLD METALS—The following are the dealers purchasing prices in cents per pound:

Copper, heavy and crucible	10.50 @	11.75
Copper, heavy and wire	11.00 @	11.25
Copper, light and bottoms	9.50 @	.....
Lead, heavy	6.75 @	6.80
Lead, tea	5.00 @	5.25
Brass, heavy	6.50 @	....
Brass, light	5.50 @	....
No. 1 yellow brass turnings	7.00 @	7.25
Zinc scrap	3.75 @	4.00

Structural Material

The following base prices per 100 lb. are for structural shapes 3 in. by ¼ in. and larger, and plates ¼ in. and heavier, from jobbers' warehouses in the cities named:

	New York	Chicago
Structural shapes	$3.34	$3.34
Soft steel bars	3.24	3.24
Soft steel bar shapes	3.54	3.54
Soft steel bands	3.99	3.99
Plates, ¼ to 1 in. thick	3.34	3.34

Industrial

Financial, Construction and Manufacturing News

Construction and Operation

Alabama

MONTGOMERY—The Alabama Cotton Oil Co., recently organized with a capital of $150,000, has acquired the plant of the American Cotton Oil Co., on North Decatur St. The new owner will take possession immediately, and plans for extensions and improvements. Operations will begin at an early date. E. T. Allen is secretary.

California

OAKLAND — The Paraffine Companies, Inc., Emeryville, Calif., has awarded a general contract to Herbert Beckwith, 351 12th St., Oakland, for the erection of a 1-story building at its local plant on San Francisco Bay, near Powell St., to be equipped for mechanical drying service. It will cost about $17,000. Leland S. Rosener, Insurance Exchange Bldg., San Francisco, is architect. The company specializes in the manufacture of paraffine papers and kindred products.

LOS ANGELES—The White Portland Cement Co., recently formed with a capital of $3,000,000, has negotiations under way for the purchase of a tract of about 15 acres of land at East Los Angeles, as a site for a new mill. It will consist of several 1-story units, with power house, machine shop and auxiliary buildings, with estimated cost reported at close to $1,000,000, including equipment. The company has acquired a tract of approximately 1,800 acres of land at Saugus, Calif., for raw material supply, and will install equipment for development and production. The new company is headed by L. V. Bentley as president. Other officials will be C. J. Rhoades and C. H. Shattuck. It is represented by Lewis Cruickshank, Los Angeles Trust & Savings Bldg., attorney.

SAN FRANCISCO—The Holmes Lime & Cement Co., 425 Kearny St., has plans under way for the erection of a 4-story lime and mortar works at De Haro and Division Sts., estimated to cost $17,000. W. H. Crim, Jr., and Hamilton Murdock, company address, are architects.

OAKLAND—The Granitized Concrete Products Co., Sanger, Calif., has leased property at 7738 East 14th St., Oakland, for the establishment of a new plant for the manufacture of cement brick and kindred cast products. It is purposed to install equipment at an early date. C. Frank Smith and J. P. Coates head the company.

GIANT—The Giant Powder Co., First National Bank Bldg., San Francisco, has awarded a general contract to George Anderson, 920 Franklin St., Oakland, Calif., for the erection of the initial buildings for its proposed new local powder and explosive manufacturing works, consisting of a group of 1-story buildings, estimated to cost $75,000. The engineering department of the company is in charge.

Connecticut

NORWICH—The Allyn Rubber Corp. is reported to be planning for enlargements in its plant with the installation of additional equipment for considerable increase in output.

MIDDLETOWN—The Standard Oil Co. of New York, Inc., 26 Broadway, New York, has awarded a general contract to Denis O'Brien & Sons Co., McDonough Pl., Middletown, for the erection of its proposed oil storage and distributing works at Sumner's Creek, comprising a number of buildings, with pumping plant, etc.

Delaware

NEW CASTLE—In connection with proposed extensions and improvements at its local plant, including the installation of additional furnaces and other equipment, the Penn Seaboard Steel Corp., 1417 Sansom St., Philadelphia, Pa., purposes to concentrate operations at this point, developing a production to provide for outputs at its former plants at Chester and Tacony, Pa. Both of these plants will be taken over by other interests.

Georgia

MACON—The Georgia Cotton Oil Co., recently organized with a capital of $150,000, has taken over the plant of the American Cotton Oil Co., on the Waterville Rd., and plans for immediate operations. It is purposed to make extensions and betterments. John T. Stevens, Kershaw, S. C., is president. Samuel D. Dodds will be in charge of production.

PERRY—The Clinchfield Portland Cement Co. has foundations in progress for the initial buildings for its proposed local cement mill, for which a general contract recently was awarded to the Spencer Construction Co., Baltimore, Md. The plant will comprise several 1-story units, with power house, and is estimated to cost in excess of $500,000, including equipment. It is purposed to commence the machinery installation at the earliest possible date.

Indiana

LOGANSPORT—Fire, Aug. 30, destroyed a portion of the fertilizer works and tank department at the plant of the Routh Packing Co., with loss estimated at $30,000, including equipment. It is planned to rebuild.

Kentucky

LEANDER—The Cumberland Pipe Line Co. is said to be planning for the rebuilding of the portion of its local oil storage and distributing works, recently destroyed by fire with loss estimated at $95,000, including equipment. The reconstruction is expected to cost approximately a like amount.

Louisiana

WEST MONROE—The C. C. Bell Mfg. Co. has preliminary plans under way for the establishment of a plant for the manufacture of mirrors and kindred glass products. Equipment will be installed at an early date. M. J. Lawler heads the organization.

OIL CITY—The Southern Oil & Refining Co., Houston, Tex., recently organized, has taken over the local refining plant of the Associated Refining Co., with rated capacity of 1,000 bbl. daily. Improvements will be made, with installation of equipment to operate under the "California cracking process," and the plant placed in service at an early date. The new company has also acquired the local grease and asphalt plant of the Union Oil & Pipe Line Co., and will commence production at once, developing to maximum capacity. Negotiations are said to be in progress for the purchase of a gasoline-refining plant in the El Dorado, Ark., district, with present capacity of 1,500 bbl. per day; it is expected to enlarge and improve this plant, with the installation of considerable additional equipment for increased output. The company is also reported to be perfecting arrangements for the establishment of a new refinery for the production of lubricating oils on the ship channel at Houston, Tex. W. G. Banks, Shreveport, La., is president of the new orzanization, and W. P. Hobby, formerly governor of Texas, treasurer.

NEW ORLEANS—The Loubat Glass & Cork Co., Belnville St., has awarded a general contract to R. P. Farnsworth & Co., 808 Perdido St., for extensions and improvements in its plant to cost close to $50,000. Work will be placed under way at once.

Maryland

BALTIMORE—The Gold Dust Corp., 111 West Washington St., Chicago, Ill., formerly known as the N. K. Fairbanks Co., manufacturer of washing and cleansing powders, soaps, etc., has acquired a tract of 12 acres of land on 5th Ave., Canton section, as a site for a new plant. Plans will be placed under way at once for the initial unit, estimated to cost close to $1,000,000, with machinery. At a later date, a second unit will be erected, with like estimated cost. The entire works will give employment to about 500 operatives.

BALTIMORE—The Simplex Engineering Co., 1 Washington Trust Bldg., Washington, Pa., has plans in progress for the

erection of a local plant for the manufacture of glass products, for which the owner's name is temporarily withheld. It is expected to cost about $55,000. Bids will be asked on a general contract at an early date.

Massachusetts

SOMERVILLE—Lombard & Co., 236 A St., South Boston, Mass., manufacturer of grinding stones and abrasive materials, has awarded a general contract to the J. S. Smith Construction Co., Newton, Mass., for the erection of a new 2-story plant, 50x180 ft., on Middlesex Ave., near Cummings St., estimated to cost $35,000. A building permit has been issued and work will proceed immediately.

Michigan

DETROIT—The Houghten Cement Block Co., 10804 Devine St., has completed plans for the construction of a new 1-story addition, to include the installation of equipment for considerable increase in output.

GRAND RAPIDS—The Burton Bronze Co., recently organized with a capital of $25,000, to manufacture bronze, brass and other metal castings, will operate a plant at 1452 Buchanan Ave., S. W. A large output will be developed. B. T. Moore is president, and John F. Vos treasurer.

Missouri

JOPLIN—The Barnsdall Zinc Co., has acquired local properties, including those heretofore held by the Goodeagle Mining Co., and plans for extensive developments and operations for commercial zinc production. It is purposed to install equipment at an early date.

Montana

HELENA—The C. T. Perry Co., manufacturer of soaps, washing powders, etc., has tentative plans under way for the rebuilding of the portion of its local plant, recently destroyed by fire with loss estimated at $100,000, including equipment.

New Jersey

TRENTON—The Murray Rubber Co., North Clinton Ave., has filed plans for the construction of a 1-story addition to its plant.

ELIZABETH—The Apex Chemical Co., 461-79 8th Ave., New York, has acquired the plant and business of the Organic Products & Color Co., and will continue operations at the local works for the production of its regular line of products. The acquired company will be merged with that of the purchasing organization. Dr. S. M. Hermann is president.

New York

BUFFALO—The Pennzoil Oil Co., Main St., is reported to be planning for the rebuilding of the portion of its oil storage and distributing plant destroyed by fire, Aug. 30, with loss estimated in excess of $150,000, including equipment.

BROOKLYN—Kienle & Co., 109 South 5th St., manufacturers of printing inks, etc., have awarded a general contract to Gillies & Campbell, Inc., 101 Park Ave., New York, for the erection of their proposed 3-story plant at Nassau Ave. and Fort Gremney St., estimated to cost $100,000, with equipment. William H. Gompert, 171 Madison Ave., New York, is architect.

Oregon

PORTLAND—The Preble Soap Mfg. Co., has filed plans for the construction of a 1-story plant on Nicolai St., near 29th St., for which foundations will be laid at once. A list of equipment to be installed will soon be arranged.

Pennsylvania

DURANT CITY—The Pennsylvania Plate Glass Corp., recently organized, is making ready to commence the construction of its proposed new plant for the production of sheet glass products on local tract of land. It will consist of a number of buildings, with power house, designed for an initial output of about 450,000 ft. per month, giving emrloyment to close to 500 operatives. The estimated cost is placed in excess of $650,000, with machinery.

FRANKLIN—The Franklin Creek Refining Co. has purchased the local oil refinery of the Lakeside Oil Refining Co., located in the Sugarcreek section, near the city limits, and will take immediate possession. Extensions and improvements are under consideration, including the installation of additional equipment.

South Carolina

HAYNE—The Smith-Wilkinson Fertilizer Co. has preliminary plans under way for the erection of a new plant for the manufacture of commercial fertilizers, reported to cost about $30,000.

UNION—The Union Oil Mills, Inc., recently organized, has acquired the local plant of the Southern Cotton Oil Co. and will take over the property at once. Extensions are under advisement, including machinery improvements and additional equipment. B. F. Kennedy is president.

Texas

CRISP—The Crisp Brick Co., Ferris, Tex., recently formed to take over and expand the local plant of the Crisp Press Brick Co., plans for the installation of additional equipment, including mixing machinery, presses, dry pan, and accessory apparatus. E. T. Cole is president.

AMARILLO—The Vacuum Oil Co., 61 Broadway, New York, has acquired a tract of about 400 acres of land in the Panhandle Oilfields, and is reported to be planning to use a portion of the site for the construction of a new refining plant.

Washington

CENTRALIA — The Concrete Pipe Co., Summa and Railway Sts., manufacturer of concrete and cement pipe, etc., will begin the immediate erection of a new 1-story addition to its plant, estimated to cost $17,000.

Wisconsin

RHINELANDER—The Daniels Mfg. Co. will begin the construction of a new plant for paper converting service, to be 1-story and basement, 60x200 ft., to cost in excess of $45,000. L. A. De Guere, Wisconsin Rapids, Wis., is engineer.

New Companies

H. & R. PAPER CO., INC., Bridgeport, Conn.; paper products; $50,000. Incorporators: Adolph and Hirsch Reinstein, 1215 North Ave., Bridgeport.

GRENCO OIL CO., Greenwood, S. C.; cottonseed oil products; $50,000. Incorporators: W. T. Bailey, G. P. Sloan and Herbert Allen, all of Greenwood.

ELECTRIC GLASS NOVELTY CO., INC., Newark, N. J.; glass tubing, etc.; $50,000. Incorporators: Hyman and Samuel Mendelsohn. Representative: David Berlin, 38 Clinton St., Newark.

TEXCEL CHEMICAL CO., New York, N. Y.; chemicals and chemical byproducts; $25,000, and 750 shares common stock, no par value. Incorporators: J. C. Sullivan, S. G. Williams and C. D. Seully. Representative: J. Williams, 2 Stone St., New York, attorney.

CHEMICO CEMENT COLOR CO., 114 Larchmont St., Los Angeles, Calif.; organized; cement colors and other chemical specialties. H. Mibielle, 6710 Miramonte Blvd., Los Angeles, heads the company.

CONSUMERS REFINING CO., 2335 North Hoyne Ave., Chicago, Ill.; refined oils; $20,000. Incorporators: William M. Murray, Charles Heinman and Roy C. Schilling.

FEDERAL MFG. & CHEMICAL CO., Wilmington, Del., care of the Corporation Trust Co. of America, du Pont Bldg., Wilmington, representative; chemicals and chemical byproducts; $2,500,000.

NORTH END MFG. & SALES CO., St. Louis, Mo.; polishes and kindred products; capital not noted. Incorporators: Charles Mueller and Robert R. Gordon, 926 Campbell St., St. Louis.

NORTH SIDE BLOCK CO., Milwaukee, Wis.; cement and concrete blocks, etc.; $20,000. James Bowler, 250 Farwell Ave., Milwaukee, principal incorporator.

GLASS-LINED PRODUCTS CO., INC., Newark, N. J.; glass specialties; $5,000,000, and 10,000 shares common stock, no par value. Incorporators: Walter D. Craft, John J. W. Kenan and Walter C. Smith. Representative: John A. Bernhard, Prudential Bldg., Newark.

SPA-NOLA PRODUCTS CO., 413 American Bldg., Baltimore, Md.; mineral products; $100,000. Incorporators: Harry K. Brooks, John T. Goldwine and Levi A. Thompson.

NEW YORK INSECTICIDE CO., New York; insecticides, chemical specialties, etc.; $100,000. Incorporators: S. Landauer, I. G. Rowley and C. H. Pettis. Representative: Coe & Harcourt, Medina, N. Y., attorneys.

DOYLESTOWN CONCRETE BRICK & BLOCK CO., Doylestown, Pa.; cement and concrete blocks, bricks, etc.; $50,000. Robert C. Wood, Doylestown, is treasurer and representative.

CAROLINA CHEMICAL PRODUCTS CO., Burlington, N. C.; chemicals and chemical byproducts; $18,000. Incorporators: Schuyler W. Stutts and Jones R. Frederick, Hillsboro, N. C., and Julius R. Harden, Burlington.

HIGH TEST GASOLINE CO., Camden, N. J.; gasoline refining; $100,000. Incorporators: Charles Degnan, William S. C. Roray and Rufus B. Thompson. Representative Charles A. Cogan, 505 Federal St., Camden.

DIMM-COGILL CORP., Philadelphia, Pa., care of the United States Corporation Co., Dover, Del., representative; paints, oils, varnishes, etc.; $100,000. Incorporators: Charles R. Dimm, J. Ray Quinn and H. F. Cogill, all of Philadelphia.

POLLARD CLAY CO., 626 Cotton Exchange Bldg., Memphis, Tenn.; tile and other burned clay products, operate clay properties; $300,000. Incorporators: J. A. Pollard, J. E. Johnson and L. E. Harrell, all of Memphis.

SUBURBAN OIL CO., Okmulgee, Okla.; petroleum products; $25,000. Incorporators: L. W. Cranston and C. E. Smith, both of Okmulgee.

SCHWARTZ ORNAMENTAL GLASS WORKS, INC., New York; ornamental glass specialties; $50,000. Incorporators: A. and W. L. Schwartz, and F. Augustin. Representative: S. M. Reichs, 220 Broadway, New York.

ACE OIL & REFINING CO., Wilmington, Del., care of the Corporation Service Co., Equitable Bldg., Wilmington, representative; refined petroleum products; $1,000,000.

NEWARK GLASSINO BAG CO., INC., Newark, N. J.; paper products; $50,000. Incorporators: L. K. Tully and Samuel Michelman. Representative: Abram Bauer, Newark, attorney.

RAINBOW PAINT & CHEMICAL CORP., New York; paints, oils, chemical specialties, etc.; $10,000. Incorporators: D. Meshirer, E. Klein and H. Minkoff. Representative: H. W. Beebe, 150 Nassau St., New York.

VALLEY CLAY PRODUCTS CO., Brownsville, Tex.; tile and other burned clay products; $100,000. Incorporators: A. A. Highbarger, Fred Ruteberg and J. C. Bennet, all of Brownsville.

SAND SPUN PATENTS CORP., Easton, Pa.; metal castings; $1,000,000. Incorporators: Chester Snyder, Easton; W. D. Moor, Birmingham, Ala., and H. L. Campbell, Lynchburg, Va. Representative: Corporation Service Co., Equitable Bldg., Wilmington, Del.

SAWTEK PRODUCTS CO., Bayonne, N. J.; composition materials; $50,000. Incorporators: Fred Thaler, Louis and Albert Samuels, 670 Ave. E, Bayonne. The last noted is representative.

KYLE OIL MILL CO., INC., Kyle, Tex.; cottonseed oil products; $40,000. Incorporators: W. D. Hart, W. B. Brenizer and J. B. Pearson, all of Kyle.

Industrial Notes

THE ELECTRIC FURNACE CO., LTD., and the AUTOMATIC & ELECTRIC FURNACES, LTD., both of London, England, announce that all large-size Wild-Farfield patent electric furnaces, with internal heaters, above 25 kw., will be jointly designed by the two companies and supplied by the first-named company. Arrangements have also been made with the George J. Hagen Co., of Pittsburgh, Pa., which has constructed a large number of electric resistance furnaces up to 350-kw. capacity, for the use of its drawings and information, so that the best British and American practice will be incorporated in the designs. The Automatic & Electric Furnaces, Ltd., will continue the manufacture and sale of Wild-Barfield automatic hardening furnaces with magnetic detector, and internally heated type of furnaces up to 25 kw.

THE DURIRON CO., INC., has concluded arrangements with the Industrial Equipment Co. of Buffalo, to represent it in Buffalo and vicinity. The Industrial Equipment Co. is composed of G. G. Crewson, formerly connected with E. I. du Pont de Nemours & Co. and with the National Aniline & Chemical Co., and A. E. Smith, formerly of the Solvay Process Co. and the National Aniline & Chemical Co.